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ABSTRACT

Contents of these hearings include the statement and testimony of the following witnesses: (1) Alan Young, Research Administrator, Research and Development Division, A. H. Robins Co.; Chairman, Board of Directors, Vitamin Information Bureau; (2) Dr. Joseph M. White, Nutritional and Medical Consultant, Miles Laboratories; (3) Dr. George Briggs, Professor of Nutrition, University of California at Berkeley; (4) Dr. George G. Graham, Professor of Nutrition and Associate Professor of Pediatrics, The Johns Hopkins University; and, (5) Dr. Cornelius J. O'Donovan, Vice President and Chief Scientific Officer, Miles Laboratory. Appended materials include: (1) Table on composite of dietary intake surveys, published 1950-1968; (2) Joint industry findings on the nutrition status of the U.S. population; (3) Analysis of the need for dietary supplements among children, based on the latest report on the nutrition survey; and, (4) news items from the "Des Moines Tribune," the "Baltimore Sun," the "Montgomery (Ala.) Advertiser," and the "Washington Post." (JM)

ED 061 363

NUTRITION AND HUMAN NEEDS—1971

HEARINGS

BEFORE THE

SELECT COMMITTEE ON
NUTRITION AND HUMAN NEEDS

OF THE

UNITED STATES SENATE

NINETY-SECOND CONGRESS

FIRST SESSION

ON

NUTRITION AND HUMAN NEEDS

PART 10—MICRONUTRIENT SUPPLEMENTS FOR SCHOOL LUNCH PROGRAM

WASHINGTON, D.C., DECEMBER 7, 1971

U.S. DEPARTMENT OF HEALTH,
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MICRONUTRIENT SUPPLEMENTS FOR SCHOOL LUNCH PROGRAM

TUESDAY, DECEMBER 7, 1971

U.S. SENATE
SELECT COMMITTEE ON
NUTRITION AND HUMAN NEEDS
Washington, D.C.

The Select Committee met at 10:08 a.m., pursuant to call, in room 1318, of the New Senate Office Building, the Honorable Robert Taft, Jr., presiding.

Present: Senator Robert Taft, Jr.

Staff members present: Gerald S. J. Cassidy, general counsel; and Elizabeth P. Hottell, minority professional staff.

Senator TAFT. The meeting will come to order.

OPENING STATEMENT BY SENATOR TAFT

Senator TAFT. The purpose of today's hearing is to explore the nutritional needs of Americans, especially of our young people, and to look at the addition of vitamin and mineral supplements to our School Lunch Program as a possible solution in terms of both effectiveness and economy.

The committee is interested in discovering the extent of micronutrient deficiencies and changes in dietary trends across the Nation. It is important to look at vitamin and mineral deficiencies in terms of economic as well as nutritional costs. I believe that some of the testimony to be presented this morning will address itself to those important questions.

There are 25 million students now participating in School Lunch Programs. The possibility of expanding the Type A, basic lunch, to include a dietary supplement containing 100 percent of the recommended daily allowances of vitamins and minerals certainly deserves the careful attention of this committee. I look forward to hearing the panel describe in detail the progress that has been made in developing such a dietary supplement.

I would like to take this opportunity to welcome our four distinguished witnesses this morning. Dr. George Graham, M.D. of the School of Hygiene of Johns Hopkins University; and the panel representing the Vitamin Information Bureau: Alan Young, administrator of the Research and Development Division, A. H. Robins Company; Dr. Cornelius O'Donovan, vice-president, Scientific Affairs, Miles Laboratories; and Dr. Joseph White, consultant to Miles Laboratories, Inc.

I believe Mr. Young is going to begin this testimony.

STATEMENT OF ALAN YOUNG, RESEARCH ADMINISTRATOR, RESEARCH AND DEVELOPMENT DIVISION, A. H. ROBINS COMPANY; CHAIRMAN, BOARD OF DIRECTORS, VITAMIN INFORMATION BUREAU

Mr. YOUNG. I am Alan Young, chairman of the board of directors of the Vitamin Information Bureau. This morning I am accompanied by Dr. Joseph M. White, nutritional and medical consultant to Miles Laboratories, Dr. George G. Graham, professor of Nutrition and Associate professor of Pediatrics, The Johns Hopkins University, Dr. Cornelius J. O'Donovan, vice president and chief scientific officer of Miles Laboratories, Daniel Johnson, associate counsel, Miles Laboratories, and Mrs. Margaret Markham, executive director of the Vitamin Information Bureau.

VITAMIN INFORMATION BUREAU

Since its establishment in 1967, the Vitamin Information Bureau has worked to obtain, collect and disseminate to members of the general public, industry, professions, public health authorities and educational institutions information as to the quality, purposes, uses and effects of vitamins and minerals and their relation to nutrition and health. The members of the Vitamin Information Bureau are manufacturers of dietary supplements, and foods for special dietary uses as well as their components.

EXPAND PROGRAM THROUGH VITAMIN SUPPLEMENTS

On behalf of the Bureau, I was pleased to accept the committee's invitation to appear here today as a coordinator of this panel of experts to explore with you the potential for expanding the benefits of the national School Lunch Program through addition of dietary supplements of vitamins and minerals. We are convinced that dietary supplements offer a practical and immediate solution to the serious public health problem of malnutrition which our country's children presently face.

During the past quarter century the national School Lunch Program has evolved to become an important force in providing adequate nutrition for America's children. Today, by furnishing nutritious meals to some 25-million youngsters, the School Lunch Program not only contributes importantly to the health of America's youth but also through good example does much to teach sound eating habits. Nonetheless, it is recognized by advocates of the now-pending Child Nutrition Act of 1971 that the full potential for the School Lunch Program has not yet been fully realized.

There is no question that the School Lunch Program as it presently exists and operates, has been an immense value in bringing about nutritional improvement of children in economic need. However, it is becoming more and more evident that even in the affluent segments of society large numbers of people—including children—remain in nutritional need. This is particularly true with respect to vitamins and minerals.

Since this nutritional need is not confined to the economically underprivileged, we believe that the School Lunch Program could and should be expanded. The potential of additional legislative authority notwithstanding, we are convinced that there can be importatnt program growth within the existing statutory framework.

VITAMIN AND MINERAL INCREASES NEEDED

This morning we would like to develop for the Committee the evidence demonstrating the need for increased amounts of vitamins and minerals in the diets of our children. Then we will present testimony on the changing American diets which will help to explain the facts revealed by nutrition status surveys. Finally, we will explain how vitamin and mineral supplements can provide an immediate and economical effective solution to the problem of providing all children at once with the proper balance of vitamins and minerals.

At this point, I'd like to call on Dr. White, who will summarize the statististical evidence which demonstrates the compelling need for an immediate mechanism for providing additional vitamins and minerals in the diets of the children of our country. Dr. White?

Senator TAFT. Thank you. We will be pleased to hear from Dr. White.

STATEMENT OF DR. JOSEPH M. WHITE, NUTRITIONAL AND MEDICAL CONSULTANT, MILES LABORATORIES

Dr. WHITE. Thank you, Mr. Young. Thank you, Senator Taft. Mr. Chairman and members of the committee; in my capacity as consultant on nutrition to Miles Laboratories, together with my colleagues at Miles, I maintain a thorough and continuous survey of the published literature concerning the nutritional status of American population groups. This morning I would like to summarize the available information on nutritional status as it applies to children in order to provide you with a basis for judging the need for additional sources of vitamins and minerals in children's diets.

NUTRITIONAL STATUS OF CHILDREN

Nutritionists are in general accord that the optimum manner for evaluating the nutritional status of any particular child is to take a dietary intake history, make biochemical analyses of numerous body substances, and conduct a clinical investigation of the child's health. Unfortunately, performing such an investigation involves a tremendous expenditure of time, talent and money and perhaps most importantly, it can validly represent the status of a particular individual for only a brief period of time. Consequently, most nutritional status investigations must be performed on an epidemiological basis wherein a statistical blend of dietary histories and limited laboratory and clinical analyses are used to give an indication of population or group nutritional status or risk. When such data drawn from sufficiently large population segments are considered as a whole, they provide reliable evidence as to nutritional status. Thus, from a public health standpoint, such evidence is highly significant and especially so when the same data are collected and analyzed at repeated intervals.

The most comprehensive survey of dietary intake in the United States was conducted by the Department of Agriculture in 1965. The Department of Agriculture has published a report of household food purchases based on a sample which was both large and representative of all United States housekeeping families. This survey investigated purchases of calories, protein, calcium, iron, vitamin A, thiamine, riboflavin and ascorbic acid.

The standard for comparison used by USDA is the Recommended Dietary Allowances established by the National Academy of Sciences National Research Council Food and Nutrition Board. The Board states that, "These allowances are intended to serve as goals for planning food supplies and as guides for the interpretation of food consumption records of groups of people."[1] The Recommended Dietary Allowances (RDA) are "those that, in the opinion of the Food and Nutrition Board, will maintain good nutrition in practically all healthy persons in the United States."[2] Within the limits of scientific knowledge, these allowances generally include a "margin of safety."[3]

The USDA found that half of the households surveyed failed to purchase diets sufficient to provide the Recommended Dietary Allowances for each of eight nutrients surveyed, as listed above, which, of course, are but a few of the nutrients essential to health. Fully one-fifth of the households purchased diets that provided less than two-thirds of these allowances for one or more of the nutrients[4] in the survey.

The USDA household survey found that there were few differences in results among the various geographic regions of the country. Similarly, the overall results did not vary greatly between urban and rural households. At each successively higher level of income a greater percentage of the households purchased diets that fully met the allowances. However, high income itself did not insure good diets, because more than one-third of the households with incomes of $10,000 and over had diets that were below the Recommended Dietary Allowances for one or more of the nutrients that were surveyed.[5]

PERCENTAGE OF INADEQUATE DIETS RISE

Perhaps the most alarming finding of the 1965 USDA household survey was that the percentage of diets which failed to meet the allowances had increased since 1955, when a similar survey had been conducted. While the 1965 survey found that 50 percent of the households surveyed failed to meet the allowances for all nutrients considered, in 1955 this percentage was 40 percent. Thus, during the decade between these surveys there had been a 25 percent increase in the percentage of families which purchased diets that failed to provide the Recommended Dietary Allowances.[6]

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[1] NAS-NRC Food and Nutrition Board, *Recommended Dietary Allowances*, "Purposes and Intended Uses", NAS Pub. No. 1694 (1968).

[2] Ibid.

[3] Ibid.

[4] USDA, "Dietary Levels of Households in the United States, Spring 1965", ARS 62-17 (1968).

[5] USDA Household Survey, *supra* note 4, p. 3.

[6] USDA Household Survey, *supra* note 4, p. 4.

This is also a very significant finding. All of the problems of establishing and validating standards notwithstanding, if one performs the same analysis at two periods in time and observes a deterioration in the quality of diet, then he must conclude that the observed downward trend is a real one.

The above information, of course, applies to the purchases of the family group and does not tell us specific information about the intake of children in these families. Also, during 1965, however, the Department of Agriculture conducted a survey of the food intake of individuals. This also was based on large and representative samples of the United States' population. This survey furnished evidence showing which groups of individuals within households and within the population as a whole are most likely to fail to consume diets which provide the Recommended Dietary Allowances.

The Department of Agriculture report indicated that for some age groups of children the average daily intake among the group was less than the Recommended Dietary Allowances for calcium, iron, vitamin A, and thiamine.[7] When an average intake level among a group is below the Recommended Dietary Allowances it is inevitable that a large number of children fail to get sufficient amounts of the vitamin or mineral in question. Even in those cases where group averages are above the allowances, it does not mean, however, that each individual systematically receives all of these micronutrients he may need. We hypothesized that in all probability even where averages are above those allowances, many individuals would still fail to meet them.

To test this hypothesis Miles Laboratories, using the technical expertise of Arthur D. Little Company, commissioned a review of the results of nearly all of the dietary intake surveys published in the United States between 1950 and 1968. The results of this review are consistent with our theory on the implications of the USDA average intake figures; namely, that even where average group intake was above the allowances a substantial percentage of the group failed to achieve them.

LACKS RECOMMENDED DIETARY ALLOWANCES

The data resulting from this analysis that applied to children are summarized in the table that is included in the testimony that will be submitted for the record.[8] We can see by glancing at the table that in all the age groups we are interested in today, that is those who would participate in the School Lunch Program, there are significant numbers of children who fail to get the Recommended Dietary Allowances of the nutrients for which data are available; namely, vitamin A, thiamine, riboflavin, iron and calcium.

This statistical conclusion is also supported by the concensus of professional nutritional opinion. Over a period of 2 years, the Food and Drug Administration conducted extensive hearings on foods for special dietary uses which include all foods offered for the specific purpose of providing vitamins and minerals.[9]

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[7] USDA, "Food Intake and Nutritive Value of Diets of Men, Women, and Children in the United States, Spring 1965," ARS 62-18, table 2A (1969).

[8] See Appendix 1, Table 1, p. 2579.

[9] Hearing on Foods for Special Dietary Uses, Dkt. No. FDC-78 (1968-1970).

During the course of these hearings the nutritional status of the United States' population was given a more complete and systematic public examination than at any previous time in our Nation's history. Based on evidence such as that outlined above and on the opinions expressed by their colleagues, 27 of our country's leading nutritionists and physicians concluded that substantial segments of the United States' population, including children, consumed diets which did not provide them with adequate amounts of vitamins and minerals. Appendix A[10] presents a detailed discussion of this disturbing picture developed during the course of these hearings before the Food and Drug Administration.

The above information demonstrates that on a qualitative basis, the children of our country would benefit from an additional source of vitamins and minerals in their diets. As in all cases, there is difficulty in quantifying the percentage of children who would benefit directly from such an addition. However, I can provide a conservative estimate based on the preliminary biochemical data which have been published by the National Nutrition Survey.[11] These results reflect nutritional status in respect to only four of the many vital vitamins and minerals; namely, iron, vitamin A, vitamin C, and riboflavin.

The fact that some inadequacies were found with respect to each of these four nutrients does not imply adequacy in all other cases. As you know, the National Nutrition Survey has not yet reported results for all of the nutrients examined and, of course, the budgetary and technological limitations with which the survey had to deal prevented the evaluation of many other nutrients.

CHILDREN WOULD BENEFIT FROM NUTRIENT SUPPLEMENT

The above limitations notwithstanding, I feel that I have been able, based on these data, to estimate the percentage of children which would benefit from a dietary supplement of iron, vitamin A, vitamin C and riboflavin. In making these calculations, a complete examination of which is included as Appendix B,[12] I have assumed that the biochemical inadequacies found were of dietary origin and I believe this is a reasonable assumption to make. Based on this assumption, I have computed the following which shows the percentage of three age groups which would benefit from the routine consumption of dietary supplements containing these four vitamins and minerals: in the age group zero to 5, 49 percent; in the age group 6 to 9, 42 percent; in the age group 10 to 16, 39 percent.

Now, when I say that as much as one-half of the children would benefit from a supplement containing these four nutrients, I must make some further commentary. There is a substantial difference between a biochemical inadequacy such as that reported by the National Nutrition Survey and a frank nutritional deficiency disease such as scurvy. Populations exhibiting numerous biochemical deficiencies but not clinical signs are customarily described as being "at risk," which means that any dietary worsening or other stress could result in the rapid appearance of frank clinical signs and symptoms.

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[10] See Appendix 1, p. 2579.
[11] HEW, "Ten-State Nutrition Survey in the United States, 1968–1970", April 1971.
[12] See Appendix 1, p. 2608.

IMPROVED NUTRITION AIDS SCHOOL PERFORMANCE

The nature of the effects on children resulting from what some call "subclinical" inadequacies of vitamins and minerals is a subject which is now being studied in a number of quarters. At the present time it is certainly fair to say that conclusive results have not been obtained. However, there have been a number of reports indicating direct improvement in school performance as a consequence of improved nutrition.[13] I am sure it will be a number of years before the full implications of such deficiencies are completely understood.

However, in the meantime it seems obvious to me that we must not wait to act until the entire picture is made clear when we have the ability to remove the problem so readily and so completely. We would certainly hate to learn at a later date that we had permanently harmed many of our children due to a failure to act. With the indications and knowledge we have today we have the responsibility to act and remove them. This responsibility is all the more clear when the solution is as modest in cost and as effective in result as that which Dr. O'Donovan will propose here today. Thank you, sir.

Senator TAFT. Thank you very much and I note, Dr. White, that you have a rather extensive appendix attached to the material that you have presented here this morning. Without objection, that will be included into the record.[14] Thank you.

Dr. WHITE. Thank you.

Mr. YOUNG. We would have liked, Mr. Chairman, to have with us this morning Dr. George Briggs, Professor of Nutrition, University of California at Berkeley. As you are doubtless aware, Dr. Briggs is one of the country's leading nutrition educators and a leading proponent of the concept of expanded School Lunch Programs. Unfortunately, Dr. Briggs was unable to appear before you today but he did prepare a written statement which I would like to offer for the record at this time.

Senator TAFT. Without objection, Dr. Briggs' statement will be included in the record at this point.

PREPARED STATEMENT OF GEORGE M. BRIGGS

I would like to express my appreciation to the committee for allowing me to place on the record my thoughts concerning the proposed expansion of the National School Lunch Program to include dietary supplements of vitamins and minerals. Since this is a matter about which I feel very strongly, I deeply regret that prior commitments rendered it impossible for me to appear before you personally.

As the members of the committee are only too aware, we are unfortunately faced at the present time with rather widespread malnutrition in our country. This committee has done a great deal to bring this problem to the attention of the general public and to stimulate the government to provide the type of overall leadership that is essential if all Americans are to enjoy good nutrition.

Whereas people are beginning to become aware that we have a significant malnutrition problem in this country, few understand its vast economic impact. I use malnutrition in this sense to mean the repeated failure to consume a proper balance, neither too little nor too much, of all the micronutrients—vitamins and minerals and the macronutrients—proteins, carbohydrates and fats which are known to be essential for human life.

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[13] E.g., Latham et al., "The Effects of Malnutrition on Intellectual Development and Learning", *J. Pub. Health 61*, pp. 1307–24 (1971); Todhunter, "School Feeding from a Nutritionist's Point of View", *Am. J. Pub. Health 60*:2302–2306 (1970).

[14] See Appendix 1, pp. **2579–2610.**

Speaking qualitatively, some of the ways in which such malnutrition appears include: nutrient deficiencies, high incidences of anemia, increased frequency of infection, underweight, overweight, severe dental problems, retarded growth, fetal problems in pregnancy, and problems with infants, shorter life spans, and behavioral and even mental problems. Other diseases such as diabetes and heart disease have a close association with malnutrition. These are not problems which are limited to any one particular social or economic stratum but rather have been shown by reliable data to affect the rich and poor alike.

I have attempted to compute a preliminary estimate of exactly what malnutrition and related diseases cost our society per year. My estimate is that the cost to society associated with these nutrition related problems approximates $30 billion a year. This includes not only the cost of treating the manifest problems but also reflects the cost of absenteeism from work and school and the cost of managing behavioral and mental problems.

At a level of $30 billion a year, nutrition related costs equal about ¼ of our total annual food bill and nearly ½ of our total health care costs. This figure is also more than 6 times the cost of providing all of our children a good school lunch. Clearly malnutrition is a problem of tremendous significance in our society.

To answer the question of why so much malnutrition occurs, we must look at what people eat and do not eat. To facilitate this I have performed an analysis of the United States Department of Agriculture data on food consumption which are published in the Department's pamphlet, "National Food Situation."

I made calculations which reveal how much of various types of foods, on a dry weight basis, the average American ate during 1970. Dry weight basis was used so that all foods could be compared without the interfering factor of their varying water content. To help make my point about the good and bad aspects of the American diet I have divided the foods into two groups of commodities. One of these I have termed "Poor Value Foods" and the other, "High Value Foods." Poor Value Foods are those which are high in calories and contain relatively little protein and few, if any, vitamins and minerals. Those which I call High Value Foods may be rich in protein but do carry either a wide variety or goodly quantities of vitamins and minerals.

The following table shows the average consumption per person of Poor Value Foods during 1970.

Poor Value Foods:	*Pounds in 1970*
Table sugar	102
Fats and oils*	53
White flour	88
Corn sugar (dextrose)	14
Milled rice	7
Total pounds	264

*This includes margarine, shortening, lard, butter, and cooking and salad oils—not the fat normally present in natural foods.

One way of characterizing these data is to say that the average person in the United States this past year consumed more than his weight in white flour and table sugar.

The next table shows the average per person consumption during 1970 of those commodities which I have termed High Value Foods:

High Value Foods:	*Pounds in 1970*
Meat (beef, pork, sheep)	74
Poultry	15
Fish	3
Eggs	14
Milk	34
Cheese	7
Ice cream	5
All fruits	18
Potatoes	25
Vegetables (all others)	24
Whole cereals	21
Peanuts, beans, others	18
Total pounds	259

Note that there is no category of High Value Foods whose average intake even approaches the 116 pound average intake of sucrose plus dextrose.

The average total annual consumption per person of the Low Value Foods is 264 pounds—slightly more than the average consumption of High Value Foods—which is 259 pounds. Thus, on the average more than half of what we eat is severely inadequate in terms of its vitamin and mineral content. Of special concern is the fact that the situation seems to be getting worse rather than better.

I am a firm believer that the School Lunch Program can play an important role in minimizing the risk of malnutrition. As you may be aware, I am among those who endorse the concept of the Universal School Lunch Program. However, there are other types of expansion within the School Lunch Program which can be of value also.

For quite some time now I have held the opinion that it is vital that the School Lunch Program provide vitamins and minerals at the level of the Food and Nutrition Board's Recommended Dietary Allowances, and with supplements the program can be extended to insure this. In fact, I would like to place on the record an abstract from my direct testimony before the Food and Drug Administration's hearings on foods for special dietary uses which were concluded this past year:

> I think that if you have a group of school children to whom you are giving a nutritious school lunch designed to provide one-third of the RDA, but you have no control over what, if anything, these children eat for breakfast and supper, it would make good nutritional sense to give them an RDA-level vitamin and mineral supplement with their lunch to make sure that they got at least recommended levels of vitamins and minerals every day. WD-46-Briggs, pp. 28–29 (March 25, 1970).

I am very pleased to see that the food industry has taken the initiative and followed through on this suggestion to the point where at least one of its members is now prepared to offer a feasible program to provide supplements for the school lunch. I think this is a good example of industry's ability and willingness to respond to the demonstrated need of our citizens for improved nutritional status. I urge the committee to support this concept for expanding the School Lunch Program and to use its influence to facilitate rapid implementation of this beneficial proposal.

Mr. YOUNG. And with your permission, I would like to summarize certain portions of Dr. Briggs' statement for it contains data which are an integral part of the picture which we seek to develop this morning.

Senator TAFT. We would be glad to have you do so, Mr. Young.

PROBLEM OF MALNUTRITION

Mr. YOUNG. In his statement, Dr. Briggs has observed that there is a growing awareness that we have a significant malnutrition problem in this country and few understand its vast economic impact. Dr. Briggs defines malnutrition as the repeated failure to consume a proper balance, neither too much nor too little, of all the micronutrients; that is, the vitamins and minerals and the macronutrients; that is, the proteins, carbohydrates and fats which are known to be essential for human life.

Speaking qualitatively, some of the ways in which such malnutrition appears include: nutrient deficiencies, high incidences of anemia, increased frequency of infection, underweight, overweight, severe dental problems, retarded growth, fetal problems in pregnancy, and problems with infants, shorter life spans, and behavioral and even mental problems. Other diseases such as diabetes and heart disease have a close association with malnutrition. These are not problems which are limited to any one particular social or economic stratum but rather have been shown by reliable data to affect the rich and poor alike.

Cost of Nutrition-Related Diseases

Dr. Briggs has attempted to compute a preliminary estimate of exactly what malnutrition and related diseases cost our society per year. He estimates that the cost to society associated with these nutrition-related problems approximates $30 billion a year. This includes not only the cost of treating the manifest problems but also reflects the cost of absenteeism from work and school and the cost of managing behavioral and mental problems.

At a level of $30 billion a year, nutrition-related costs equal about one fourth of our total annual food bill and nearly one half of our total health care costs. Dr. Briggs estimates further that this figure is also more than six times the cost of providing all of our children a good school lunch. Therefore, malnutrition is a problem of tremendous significance in our society.

To answer the question of why so much malnutrition occurs, we must look at what people eat and do not eat. To facilitate this, Dr. Briggs performed an analysis of the United States Department of Agriculture data on food consumption which are published in the Department's pamphlet, "National Food Situation."

His calculations reveal how much of various types of foods, on a dry-weight basis, the average American ate during 1970. I must emphasize that these are dry-weight values—all water having been removed. Dry weight basis was used so that all foods could be compared without the interferring factor of their varying water content. To help make this point about the good and bad aspects of the American diet, Dr. Briggs divided the foods into two groups of commodities. One of these he termed "Poor Value Foods" and the other, "High Value Foods." Poor Value Foods are those which are high in calories and contain relatively little protein and few, if any, vitamins and minerals. Those which he calls High Value Foods may be rich in protein but also includes those that carry either a wide variety or goodly quantities of vitamins and minerals.

The following table shows the average consumption per person of Poor Value Foods during 1970. He lists table sugar, 102 pounds; fats and oils, 53 pounds; white flour, 88 pounds; corn sugar, 14 pounds; and milled rice, 7 pounds, for a total of 264 pounds.

One way of characterizing these data is to say that the average person in the United States this past year—that is, 1970—consumed more than his weight in white flour and table sugar.

The next list summarizes the average per-person consumption during 1970 of those commodities which Dr. Briggs terms High Value Foods: Meat, including beef, pork and lamb, 74 pounds; poultry, 15 pounds; fish, 3 pounds; eggs, 14 pounds; milk, 34 pounds; cheese, 7 pounds; ice cream, 5 pounds; all fruits, 18 pounds; potatoes, 25 pounds; vegetables, 24 pounds; whole cereals, 21 pounds; peanuts, beans, others, 18 pounds for a total of 259 pounds.

Note that there is no category of High Value Foods whose average intake even approaches the 116-pound average intake of sugar.

Dr. Briggs concluded his statement by expressing his support for extending the School Lunch Program's effectiveness through the inclusion of dietary supplements of vitamins and minerals.

Societal Patterns of Food Consumption

It's not enough to measure the fact that the nutritional status of people is less than optimum or to explain in competent terms the reason why. Before we can address ourselves strictly to the resolution of present nutrition problems, we must discover why people eat the way they do. To help us in this regard, I would like to yield the floor to Dr. Graham, who will explain the societal factors leading to the pattern of food consumption outlined by Dr. Briggs and the implications which these factors left for our food supply during the coming decades.

Senator Taft. We would be glad to hear from Dr. Graham.

STATEMENT OF DR. GEORGE G. GRAHAM, PROFESSOR OF NUTRITION AND ASSOCIATE PROFESSOR OF PEDIATRICS, THE JOHNS HOPKINS UNIVERSITY

Dr. Graham. Mr. Chairman, ladies and gentlemen; the present day concern over the nutritional status of our childhood population is based on some well documented evidence and unfortunately, on some inflated statements. Three major classes of documentation exist: dietary surveys, laboratory determinations, and clinical and anthropometric examinations.

The dietary surveys attempt to determine what foods groups of individuals are consuming, the amounts and their content of essential nutrients. This last is compared with the Recommended Dietary Allowances of the Food and Nutrition Board of the National Research Council. These allowances, with the sole exception of that for calories, have a considerable safety margin. Thus, an individual might be consuming considerably less than the RDA of one or more nutrients and still be in excellent health.

Another type of evaluation of the diet data from such surveys, but of considerably less reliability, is an assessment of their content of certain foods or groups of foods; for example, the basic four foods. Even when carried out by the most competent professionals, dietary surveys have many sources of possible error.

Biochemical determinations, when carried out properly are generally a reliable indicator of the state of nutrition. Some, such as serum albumin or hemoglobin, actually measure an important constituent of the body with a well-known normal range and a clear understanding of the significance of deviations. Most of the other determinations, however, are measuring the concentration in blood or the amount excreted in urine of a particular nutrient at a given moment. The significance of deviations from the normal range is less well understood, lending itself frequently to erroneous interpretation.

Measurements of height, weight and other body dimensions must be related to proper standards and must take into account genetic differences. When applied to groups of children, these anthropometric data are of great usefulness. Clinical examinations for evidence of a specific nutrient deficiency yield significant data in populations where malnutrition is rampant. They are disappointing when used in populations where malnutrition is only marginally present.

The Problem in the United States

Surveys carried out in the United States during the past decade do show a deterioration in the micronutrient content of the diets of many groups, particularly the poor, the adolescent, the pregnant and the elderly. This is particularly notable for iron, calcium, vitamin A and ascorbic acid. If this trend is to be checked, attention must first be given to its causes.

ETHNIC GROUPS

For certain groups, especially the American Indian, the Mexican-American and the Puerto Rican, a most important factor is the disruption of traditional patterns of food consumption caused by incomplete adaptation to a new way of life. Time and, to a certain extent, nutrition education might correct the deficiencies encountered but this is doubtful at best. Fortification of traditional foods, or supplementary items would almost certainly prove of greater value until necessary improvements in social and economic status make possible a more permanent solution.

THE ELDERLY

For the elderly, the problem is usually of a more tragic origin. Forced by our social mores to live by themselves they are no longer motivated to buy, prepare and serve the traditional foods they know or to clean up afterwards. In many cases, they are unable to chew these foods. As a result, they turn to the consumption of baby and junior foods, pastries and beverages. No amount of nutrition education will solve their problem. They know what the classic concept of a balanced meal is. They need a whole new generation of fully fortified convenience foods tailored to their likes and capabilities, both physical and economical. Better still, we should take them back into our homes where they belong.

PREGNANT WOMEN

The poor diets of many pregnant women are causing considerable preoccupation today because of the possible ill effects on their unborn children. To a very great extent, this is a problem of teenage mothers who are themselves not yet fully grown. Forty percent of first born infants in this country are delivered by girls 19 years-of-age and younger. Poor eating habits are not corrected during pregnancy, some because of poverty and ignorance, others because of medical restrictions and many more because of deeply entrenched habit.

INFANTILE MALNUTRITION

Infantile malnutrition is not an uncommon problem in this country but is almost invariably the result of profound social problems, with a major deficiency being one of adequate mothering.

ADOLESCENTS

Elementary school children and adolescents are our concern here today. Numerous surveys have shown a significant percentage of these children are consuming diets which are considered anywhere from marginally deficient to atrociously so, depending on the point of view. When compared to the traditional pattern of foods and meals as most of us know them, the species is faced with extinction. When compared to the Recommended Dietary Allowances of nutrients, most of these diets are adequate, but many of them barely so, and quite a few are deficient, particularly in ascorbic acid, vitamin A, calcium, and iron.

Laboratory determinations of nutrient levels frequently correlate poorly with the results of dietary surveys. In one important study from Nebraska, it was shown that the regular consumption of vitamin supplements was making up for the dietary deficiencies and correcting the biochemical indices. Other studies have suggested that the blood level of many nutrients is dependent on factors other than the consumption of those very same nutrients. Important is the fact that the RDA's are set high and that the great majority of the deficient levels of intake are still adequate to maintain normal or near normal biochemical indices and apparent good health. Still, many of these people may be at risk.

Thus, there is no biochemical or clinical evidence of calcium deficiency to match the dietary figures. The problem of iron deficiency and hypochromic anemia in late infancy is a special one whose causes are not well appreciated. In fact, the majority of these anemias disappear spontaneously by school age and only surface again in the teenage girl, particularly when she becomes pregnant, since she most likely has not developed adequate iron stores. Biochemical indices do confirm the low levels of vitamin C intake and, to a certain extent, those of vitamin A and some vitamins of the B group. In some surveys moderately low levels of serum albumin confirm the low figures for protein intake.

Anthropometric studies among the poorer sections of our society reveal a significant percentage of school age children to be growing at a rate below the expected norm. Although some of this poor growth may represent genetic differences, it is almost certain that it represents inadequacies in the total intake or utilization of calories and protein.

Clinical examinations in school age children are usually nonproductive. High rates of dental caries are often found, in part the result of low-fluoride intake, to a greater extent the result of a high consumption of refined sugar. In scattered areas, enlarged thyroid glands result from inadequate intakes of iodine. The endemic area for this used to be northern Ohio.

With all due respect to some opinion, there is no clinical evidence of vitamin C deficiency to match the dietary and biochemical evidence, most probably because our RDA and our standard of normalcy are set much too high. Almost exactly the same is true for vitamin A. Significant clinical deficiency of any of the B vitamins in school-age children is a rarity in this country.

NUTRITIONAL QUALITY OF DIETS DETERIORATES

There is little doubt about the deterioration in the nutritional quality of the diets consumed by a gradually but steadily increasing percentage of children from all classes. The great majority consume enough or too much protein and total calories but a significant number are growing at rates which suggest inadequacies in total amount of food, at least by our present standards. In the case of certain nutrients, these inadequacies are being reflected in biochemical indices but thus far there is little or no clinical evidence of deficiency.

If the trend continues, we may in the not too distant future begin to see such clinical manifestations. It is also probably true that the regular consumption of vitamin and mineral supplements by many children corrects the deficiencies apparent in the diet and normalizes the biochemical indices.

TREND TOWARD CONVENIENCE FOODS

Underlying most of the changes being seen in the nature of the diet is a growing trend toward the consumption of convenience foods. Most young people, and with good reason, do not see why we make such a big production of our meals. They want something that they like, regardless of how monotonous it may seem to us, something that is easy to consume without a whole arsenal of utensils that must then be washed. They want something that can be consumed in a few minutes and that does not keep them from other more interesting activities. They are most receptive to the idea of consuming their vitamins in a concentrated form without having to bolt down the entire unattractive package in which nature chose to put them, such as spinach, broccoli, Brussel sprouts and the like. We are shocked when we find that items which we like, or were forced to like because of their nutrient content, are turned down with a "yukk!" even when we know full well that they are not really necessary anymore. My youngest daughter describes orange juice as "hairy." If it wasn't for the fact that it was as repulsive to the giver as to the receiver we might still be forcing cod liver oil into our children.

This overwhelming trend toward convenience foods is not just a decision of the children but to a very great extent that of their harried mothers, glad to be freed from the increasing cost of traditional foods and the burden of their preparation and serving. This begins with the complete infant formulas of today, which are nutritionally superior and yet immeasurably simpler to prepare than the formulas we were brought up on.

COST OF AGRICULTURAL COMMODITIES INCREASES

Let me pause at this point to discuss some of the reasons for the increasing cost of many agricultural commodities which we think of as traditional foods. If you look at the individual traditional food items, you will see that most of them are high-cost items in terms of production. Some of them, such as meat, involve a high cost in terms of grazing land. As our population grows, there will be pressure to use land for other purposes and it will cost more to keep land available for cattle grazing. Inevitably, we will see an increased tendency toward moving land from agriculture into "urban" uses.

Secondly, when one looks at traditional foods he sees that a great number require large amounts of human labor in their production. This is most evident in the case of fruits and vegetables, where generally the product must be picked by human hands. For a number of years, we have relied on having this produce picked by migrant laborers.

Apparently the maintenance of such a labor force is now inconsistent with our national conscience. Consequently, we are seeing a movement toward unionization of farm workers. Inevitably the attaining of this goal will result in an increasing expense associated with production of fruits and vegetables. This will mean that persons in the lower-income strata will find it increasingly more burdensome to purchase these commodities, and if they have some alternative they will probably take it.

I might add that as evidence of the trend toward increased cost of vegetable production in the United States, that at the present time a substantial fraction of our fresh produce is actually grown in countries where labor is cheaper than in the United States.

The increased cost of vegetables and other traditional produce may not be a bad thing. It may be simply that our country has to make the choice between whether it is going to obtain its vitamins and minerals from fruits and vegetables or whether it is going to permit all men to enjoy a higher standard of living than that of the agricultural migrant.

POOR GROWTH RATES AND ANEMIA

There has been little or no scientific evaluation of the nutritional value of School Lunch Programs. What little has been done thus far reveals no evidence of improvement in poor growth rates and anemia, where these are important. Until proper evaluations are carried out we can only speculate about the possible causes:

1. The total amount of nutrients consumed, being only one-third of the estimated needs for the day, 5-days a week when school is in session, may not be enough to correct existing deficiencies;
2. Consciously or subconsciously, many of the children who are fed in school may receive less at home. We have seen this in other countries;
3. Actual consumption of the food offered may be very low, particularly by some of those most in need. This may be because the meals are made up of unfamiliar and unappealing constituents dictated on the basis of traditional concepts by individuals of another age, another race, or another cultural background. There may be physiologically-based rejection of important items such as milk by certain racial groups. Last but not least, poor preparation and presentation may cause rejection;
4. The cause of the poor growth may not be an inadequate intake but incomplete utilization because of extraneous factors such as infection; and

5. The items chosen or their preparation might result in the unavailability of micronutrients needed for optimum utilization.

POSSIBLE SOLUTIONS

The sincere hope of most of our community of nutritionists is that this increasing problem can be solved by going back to the good old days of natural foods, bought fresh, carefully prepared and served with careful attention to the basic food groups, the colors of our vegetables and other articles of faith. There are those who yearn for the general practitioner and the pediatrician who made housecalls, preferably in his horse and buggy. Some would also like to go back to the live-in maid, the handyman, the trolley car and other gracious symbols of the past era. They see the School Lunch Program as an important vehicle for nutrition education, an education based on traditional foods. This is an impossible dream.

If you will allow me, I'd like to show you just a few slides. These photographs were taken, not too professionally, at the doctors' dining room in the Johns Hopkins Hospital. We have a very fine cafeteria offering a choice of cold foods.

As you see here in the next slide, hot foods, a variety, and generally well prepared.

May we have the next slide? This is a typical tray of hot foods, quite attractive, and you notice in this case, it's a lady who's choosing it.

Next slide. This tray is more typical of what we see in the doctors' dining room, despite the availability of a whole variety of other foods. It's a hamburger, a bag of potato chips and a cola drink.

Next slide. This is a group of young interns and residents consuming their hamburgers, potato chips and cola drinks.

Next slide. This is another one. He has a piece of pie and coffee, but still the hamburger and the potato chips.

Next slide. The tray on the right, which is a hot meal, is being consumed by one of the senior members of the staff who's in the picture.

Next slide. This is another group. In this case, hot dogs and cola drinks.

Next slide. That's it.

This is one of the most highly educated group of young people in this country. None of them were from less than the upper 2 percent of their college class. They all attended top medical schools, most of them Johns Hopkins. They all know about nutrients and yet they choose the same monotonous diet day in and day out—hamburger, bag of potato chips, sometimes two bags of potato chips, and cola drinks.

The reasons for this? Part of this is economic. It costs a little less than the hot meal but to a great extent, it's a matter of habit and convenience. This they eat in a hurry, they are used to it. I am not saying they eat this way all day. The ones who are married usually go home to a good dinner, but this trend is a very powerful one. I might add, we didn't see a single one of those interns and residents smoking. Not one in ten smokes cigarettes. They are not dumb.

There should be nutritional education, and it should deal with nutrient requirements and the many ways in which they can be met. It should talk of the hazards of obesity, diabetes, and degenerative vascular disease. It should cover the hazards to the unborn child of being carried by a mother who is too young, still growing and poorly nourished for such an important undertaking.

I firmly believe that the trend to convenience foods is a relentless one and almost certainly a desirable one, if we recognize its causes and make certain that these foods are all properly fortified in a balanced manner and take into account the rapidly expanding knowledge about overnutrition and its consequences. There is much to be done in the way of nutrition research, technology and regulation. Until all the existing problems are worked out, we must recognize that we are in an era of rapid transition. We will have to use temporizing solutions which will hopefully prevent further deterioration of the present situation.

Vitamin and mineral supplements added to the school lunch might be one such expediency and deserves serious consideration. At the present moment, it may make possible an improvement in the overall dietary pattern, bringing it closer to being within the Recommended Dietary Allowances, and an improvement of the biochemical indices for most nutrients. It might also serve as a temporary protection against the appearance of clinical deficiencies until such time as more definitive solutions appropriate to our society and the level of development are reached. It should be undertaken only with definite plans for development of methods of sufficient sophistication which can be used on a scale large enough to provide meaningful scientific evaluation of its results.

Thank you. Mr. Young?

Development of Dietary Supplements

Mr. **Young**. Several of the companies which are members of the Vitamin Information Bureau have been investing large amounts of ingenuity and research resources to develop products which would provide solutions of the type indicated by Dr. Graham's presentation as being needed.

One of these solutions, which offers the advantage of effectiveness, economy, and immediate availability, is the dietary supplement. At this time, I would like to ask Dr. O'Donovan, Vice President of Miles Laboratories, and Mr. Johnson to outline for the committee the reasoning of Miles Laboratories in support of using dietary supplements in the School Lunch Program and the work that Miles has done to develop an appropriately suited product.

Dr. O'Donovan will also describe various aspects of the prototype product itself.

Senator **Taft**. Dr. O'Donovan.

STATEMENT OF DR. CORNELIUS J. O'DONOVAN, VICE PRESIDENT AND CHIEF SCIENTIFIC OFFICER, MILES LABORATORY

Dr. **O'Donovan**. Mr. Chairman, ladies and gentlemen; this morning the previous speakers have discussed scientific data and underlying reasons explaining the need for additional sources of vitamins and minerals in the diets of America's children. They have also recommended in general terms the addition of dietary supplements to the National School Lunch Program as being a solution to this end.

Now, I would like to describe for you the analysis of the school lunch performed by Miles and the product which we have developed to expand its capability to meet a child's complete vitamin and mineral needs.

The Type A school lunch is designed to provide approximately one-third of the Recommended Dietary Allowances for children 10 through 12 years of age. Though there is significant variation, comprehensive studies have shown that indeed the Type A school lunch is widely successful in achieving this objective.* Although the lunch successfully meets the objective of providing one-third of the Recommended Dietary Allowances, it does not attempt to make provision for the total daily micronutrient needs of children.

SUPPLEMENT TO PROVIDE DAILY NUTRIENT NEED

This does not represent any shortcoming on the part of the meal planners; it is a restriction inherent in the use of agricultural food items as a source of vitamins and minerals. Micronutrients in such food are tied to calories and bulk. Bulk and satiation limit the amount of food which can be consumed during any one sitting. Consequently, there is a limit to the amount of micronutrients which can be supplied through agricultural foods. Only supplements permit the school lunch to furnish an umbrella of vitamins and minerals which will meet the full day's needs, because they contain little bulk and virtually no calories.

Another complicating factor facing the administrator of a School Lunch Program is that of unavoidable micronutrient losses, such as those pointed out by Dr. Henry Schroeder.** Losses can occur between the time food is harvested and when it is delivered to consumers through delays in transportation and handling. Many foods once processed are held in storage for long periods of time causing additional losses. In an institution situation where food is prepared in a central kitchen and taken to remote points for consumption, the time and methods used in making the food distribution frequently result in losses.

Finally, there are losses due to plate waste. As we move in the direction of expanded school feeding programs some of these problems may increase. However, the use of supplements can prevent any danger that the children will suffer as a consequence.

Children customarily receive the school lunch during approximately one-half of the days of the year. Consequently, the School Lunch Program as now constituted meets only about one-sixth of a child's total annual vitamin and mineral needs. Present technology could enable the program to provide, through dietary supplements, the Recommended Dietary Allowances of most vitamins and minerals.

There is limited knowledge and virtually no control over what children eat when not at school. From the data that have been dis-

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*Murphy, "Vitamin Content of Type A School Lunches," *J. Am. Dietet. Assoc.* 55:372 (1969); Murphy, "Major Mineral Elements in Type A School Lunches," *J. Am. Dietet. Assoc.* 57:239 (1970).

**Schroeder, "Losses of Vitamins and Trace Minerals Resulting From Processing and the Preservation of Foods," *Am. J. Clin. Nut.* 24:562 (1971).

cussed here today, it is known that frequently diets that are selected by children themselves or furnished to them, lack sufficient amounts of vitamins and minerals. Dietary supplements of vitamins and minerals are intended to insure that the users obtain recommended amounts of micronutrients. The reason that vitamin and mineral supplementation on an insurance basis is useful for all children is that one cannot with practicality ascertain which children are failing to meet all their micronutrient needs. There is no specific hunger for vitamins and minerals as there is for bulk and calories. The hunger for vitamins and minerals is a hidden one.

Miles Laboratories first became interested in the concept of a dietary supplement for the National School Lunch Program several years ago through discussions with Dr. George Briggs of the earlier mention, Professor of Nutrition, University of California at Berkeley and Dr. Jean Mayer, Professor of Nutrition at Harvard. These gentlemen suggested that dietary supplements could provide an effective and highly economical source of micronutrients for use in the School Lunch Program. Dr. Mayer reiterated his support in testimony before this committee on October 14* last.

Since that time, Drs. Briggs and Mayer, together with Dr. George G. Graham, who's with us today, Professor of Human Nutrition and Associate Professor of Pediatrics, Johns Hopkins University; Dr. William J. Darby, Professor of Nutrition in Medicine, Vanderbilt University School of Medicine; and Dr. David B. Coursin, Director at Research Institute, St. Joseph's Hospital, Lancaster, Pennsylvania, have provided continuing and valuable assistance to us in developing the concept of supplements for the School Lunch Program.

As I mentioned above, the basic objective of our proposed program is to provide a product which would assure that the children received the Recommended Dietary Allowances for as many vitamins and minerals as feasible.

The formula which we used as a starting point for our prototype products was suggested during the Food and Drug Administration's hearings on special dietary foods by Dr. W. Henry Sebrell, Jr., Past Chairman of the NAS/NRC Food and Nutrition Board Committee on Recommended Dietary Allowances. Dr. Sebrell recommended this formula as being appropriate for use in children's dietary supplements generally. Its objective would be to provide the Recommended Dietary Allowances established for children between the ages of 8 and 10.

After consultation with the experts listed above, we arrived at an adjusted formula which contains the RDA for each of the micronutrients suggested by Dr. Sebrell, with the exception of calcium which we have not been able to include at more than one-fourth of its Recommended Dietary Allowance level because of the extreme bulk of this ingredient. Nor has magnesium been included because of its extremely unpleasant taste characteristics; characteristics which cannot yet be masked in chewable supplements. Research on this problem is continuing. Finally, vitamin D is provided at one-half of the RDA level in view of our expectation that most School Lunch Programs would contain milk which is usually fortified with this vitamin, and it's my understanding that 85 percent of all commercially available milk is fortified with vitamin D. The complete vitamin/mineral content of our product will be as set forth in the following table:

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*See Part 9—Universal School Lunch Program, hearing of Thursday, October 14, 1971.

Vitamin A	3, 500. 0 Units.
Vitamin D	200. 0 Units.
Vitamin C	40. 0 mg.
B-1 Thiamine	1. 1 mg.
B-2 Riboflavin	1. 2 mg.
Niacinamide	15. 0 mg.
B-6 Pyridoxine	1. 20 mg.
Folic Acid	0. 1 mg.
d-Calcium Pantothenate	5. 0 mg.
Vitamin B-12	5. 0 mcg.
Elemental Iron	10. 0 mg.
Iodine	0. 11 mg.
Calcium	250. 0 mg.

NO DANGER IN EXCESSIVE CONSUMPTION

A product which provides on a daily basis the nutrients listed above is a very nutritious one indeed and this, like the commercial supplements we market for children, is completely safe for routine consumption on a one-unit-per-day basis, which is what we intend. I am sure you have heard a number of stories about the hazards resulting from ingestion of vitamins and minerals in inappropriate amounts and I can assure you that this product does not present any of those hazards.

A supplement can contain all the vitamins and minerals that a child should have during the course of his daily diet but it will do the child no good unless the child will consume the product. We have expended considerable degree of effort to develop a product which will be acceptable to children and which will reliably provide the micronutrients which we have listed.

A chewable form has been selected which is palatable to children and allows us to be very certain that the amount of vitamins and minerals contained in this supplement is in fact delivered to the child. Further, this form emphasizes the food status of the supplement and its dietary role.

To mask the rather unpleasant taste of some of the nutrient ingredients, a number of flavors, fruit flavors, were tested and the best of these are represented in the five product flavors we have here today to show you. I would like to invite you to try one at this time. Here is one, Senator Taft. Now, these are not packaged in their finished and final form. This is just a recommended mock-up type of carton we have been using for the present and you may have a little difficulty tearing that cellophane wrapper.

As you can see, we have packaged each supplement individually in a cellophane strip wrapper. And these could be distributed to schools on a bulk basis with approximately 400 of these wafers to a carton.

ADVANTAGEOUS PRODUCT COST

One of the very strong advantages of using a supplement product such as the one I have just described, to provide on an immediate basis the vitamin and mineral needs of children, is its extremely low cost. Our calculations indicate that we can provide a product in the form described above at a cost of about a penny per child per day.

Thank you, Senator.

Senator TAFT. Thank you, Dr. O'Donovan.

Mr. YOUNG. Mr. Chairman——

Senator TAFT. Yes.

Mr. YOUNG. I hope that we have been successful this morning in showing the committee that there is a need for increased amounts of vitamins and minerals in the diets of our children; the reasons why this need exists; and the value of dietary supplements as an immediate and appropriate solution to this problem.

Further, I would like to thank you, the committee, for affording us the opportunity to appear here today. This hearing constitutes another example of this committee's outstanding service to the public in its role as the country's nutrition conscience. If any of the members of the committee would like to ask questions of our panelists, I'm sure they would be happy to respond at this time and to furnish any additional information for the record which would be of service to you.

Senator TAFT. Thank you very much, Mr. Young. Let me first thank you and all of the witnesses for their appearances here this morning. I think it has been most interesting and most helpful in at least getting us started on what might be a rather important basic question as to whether this type of supplement should be included in the School Lunch Program.

I have a number of questions for various members of the panel. Let me begin with Mr. Young.

Mr. Young, could you expand somewhat on the operation of the Vitamin Information Bureau as to how many members you have: whether you have a regular publication; what type of research staff you may have.

Mr. YOUNG. Yes, sir. The Vitamin Information Bureau is a nonprofit educational organization in nutrition education. As I mentioned earlier, it was established in 1967. It is supported by eight companies, manufacturers of vitamin and mineral products. We have an executive director, Mrs. Margaret Markham, who is here today. The purpose of the Vitamin Information Bureau is to provide authoritative information on nutrition, which is distributed to the general public or to other individuals who write in and request the information.

Other individuals include professional people in the field of nutrition; school teachers, public health people, and others. We have received requests from just about all walks of life for some of the materials that we provide.

The medical director is Dr. Elmer L. Severinghaus, who reviews the materials that we publish, and also there are other consultants who review the publications for medical accuracy.

Senator TAFT. Thank you very much.

All of the members of the panel are invited to answer or expand upon any of the questions. In many instances you may know among yourselves more appropriately than I which member may best be able to answer the questions.

This first one is perhaps for Mr. Young.

On page 2 of your testimony, you mention certain constraints within the present program. Would you elaborate on what those constraints are?

You say, "We are convinced there can be an important program within the constraints of the existing statutory framework."

Mr. YOUNG. I do not believe I said constraints, sir, I have that struck in my copy and I said, "It is important within the existing statutory framework."

Senator TAFT. Then you do not think there are constraints on reflection?

Mr. YOUNG. I felt that it would be possible to provide this through the present, existing statutory framework as a food supplement.

Senator TAFT. That would have been my opinion; that is why I asked the question.

Are there any other members of the panel who would like to comment on that?

NO RESTRAINTS ON FUNDING PRODUCT

Dr. WHITE. Miles asked the law firm of Kirkland-Ellis here in Washington to look at this issue and it was the opinion of that firm that there was no restraint in the law as it now exists to funding this type of supplement.

Senator TAFT. If you have an opinion to that effect, I think it would be most welcome for inclusion in the record.*

Dr. WHITE. We would be happy to supply that, Senator.

Senator TAFT. Thank you.

Mr. YOUNG. Are those words included in the record?

Senator TAFT. No, they are not. I apologize. I was reading your statement, I did not note the correction, if you made it.

Mr. YOUNG. I think possibly this could be an optional item in the School Lunch Program to be adopted by the States or districts as the need exists or as they recognize it as a need.

Senator TAFT. Another question, to what extent is there a necessity for continuous supplementation of diets in this direction?

In other words, how frequently can deficiencies occur in particular situations? I am not familiar and I am not sure the record shows how quickly deficiencies in particular vitamins occur. I imagine they vary, but I would welcome an opinion.

FREQUENCY OF VITAMIN DEFICIENCY

Dr. WHITE. All vitamins are classified as to their solubility, those that are oil soluble tend to build up long-term deposits in the body and if these deposits are full, the deficiency will occur only after considerable time will have passed.

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*See Appendix 1, p. 2610.

On the other hand, there are vitamins which are water soluble. The reserves of these are more readily eliminated from the body. Among these would be substances like vitamin C. The history of the discovery of scurvy and treatment of it with lime juice in the British Navy, tells us that it was not until man moved off land into a closed system as on shipboard, where he had extremely limited intake for periods of 6 weeks or more, did the problem develop.

So this gives us some idea of the parameter of time. Of course, to get an accurate time factor we would have to know where we start. If the individual were completely saturated with vitamin C at time zero, it would take longer than if a person were in a border-line condition.

This is our concern the biochemical data suggests to us that a lot of people are in the border-line situation, therefore, the outbreak of frank clinical signs might be relatively rapid for some persons.

Senator **Taft**. It has been pictured as a deteriorating situation in respect to the surveys and reports that have been commented on here this morning.

How do you relate those to the apparent continued growth size factors in particular?

In other words, in view of this situation, how do you fellows explain the basketball teams and professional football teams and the like?

Dr. **Graham**. I think I was very careful to point out in my presentation that the deterioration is not clinical evidence in terms of micronutrients. It is evidence in the composition of the diets and some of the biochemical indices.

What is alarming is the fact that it is deteriorating and getting close to the level where clinical deficiencies might become apparent.

PROBLEM OF OVERNUTRITION

I might hasten to add that the biggest nutrition problem in this country is still overnutrition and that there is good reason to wonder whether we are doing right in pushing the growth of our children to its maximum such as in the football player and basketball player.

It may be very desirable in those sports to be big, but almost certainly for man as a race, it is not desirable. This must be taken into account in our nutrition education. Unfortunately, we have been pushing the idea that more is better, and this is not necessarily so. Probably, some degree of balanced undernutrition would be desirable for most people.

As someone said, I think that two-thirds of the people in this country should go to bed hungry every night.

Now, we establish the pattern of eating that leads to obesity and its complications in later life. We establish that pattern in early childhood, and certainly we must take this into account when we are planning things such as a School Lunch Program.

The idea of balance diets rather than just amounts.

Senator **Taft**. Thank you.

Dr. Graham, would you explain how the recommended dietary allowances of essential nutrients are arrived at by the National Research Council and particularly the importance of the safety margins.

Dr. GRAHAM. In arriving at these, the minimum daily requirement is established on the basis of scientific balance studies: the smallest amount that will keep a person in balance and free of clinical deficiency. In making the recommendation, allowance was made for individual variation, because two individuals of exactly the same age and size may have slightly different requirements for individual nutrients.

Then another allowance is made for waste by the body: losses in the stool, losses in the urine, losses through the skin. A safety margin is added, which is roughly 30 percent.

Then, variations in size among people is taken into account, so that for most of the nutrients with the exception of calories, where it would not be desirable to put in a safety margin, you end up with figures that are probably twice the minimum daily requirement.

In answer to your earlier question, we now have a new type of experience telling us how quickly people become deficient in vitamins. We are doing more and more total intravenous feeding of people. This has been made possible by new techniques.

BERIBERI FROM LACK OF THIAMINE

If a vitamin is omitted from this mixture, then its deficiency will become obvious rather quickly. We are dealing with a pure situation which we know about. Usually the first vitamin deficiency—the first deficiency to become apparent is thiamine, starting in about 2 weeks.

You give all the calories and proteins he needs and not any thiamine, and he will develop beriberi in about 2 weeks. This is usually the first one.

Senator TAFT. Could you give us a brief explanation of the difference between macronutrients and micronutrients?

MACRONUTRIENTS AND MICRONUTRIENTS

Dr. GRAHAM. Macronutrients are the building blocks of the diet, protein being the most important. All cells require protein to be formed constantly and to be regenerated constantly. Most of the cells in our body, with the exception of the central nervous system, are broken down and reformed. This is a key element.

The other major element is calories. It can come from carbohydrates or fat. It does not make too much difference to the body which of the two it comes from. Fat has the advantage of greater caloric density: you can consume more calories in a smaller amount of food. These are the primary sources of energy. Even at total rest the body is consuming, roughly, in the case of an adult, one-third of our calories, just to stay still. The body's needs to keep vital systems going require that.

There are requirements for activity and for losses through the skin, stool and urine; and in children, of course very important, the requirements are added for growth.

Senator TAFT. On page 9 of your statement, you made the observation that the limited evaluation of the School Lunch Program reveals no evidence of improvement in growth rates and anemia.

What in your opinion would be the value of vitamin and mineral supplements in this connection?

VALUE OF SUPPLEMENTS

Dr. **GRAHAM.** I think this is an important deficiency in the School Lunch Program. We are relying to a great extent on impressionistic statements about children doing better in school when the school breakfast or lunch is taken. There has been little measuring of the effect of the School Lunch Program particularly in those populations in which we do encounter deficiencies in size and hemoglobin.

Senator **TAFT.** How about the breakfast program?

Dr. **GRAHAM.** Again there have been no scientific evaluations that I am aware of, of the actual nutritional state of the individual. There are studies showing the effect of correcting the anemia of the child: it has effects on his learning potential and attention span in school. This has not been through the School Lunch Program. This is studying the effect of a child with anemia and one without anemia.

We have done a small study in Baltimore—in a number of schools we compared growth throughout the whole school year of children who were receiving the school lunch and those who were not.

In this population there was a significant number of children that were below par in size and hemoglobin. We could show no effect of the School Lunch Program in one year.

I enumerated some of the possible causes. One that disturbs me considerably is how well is it consumed? Food that is not consumed has no nutritional value—has a nutritional value of zero.

I think it is practically impossible to guarantee an appetizing attractive school lunch in every school in the country. There is a great deal of variation. Some are very successful and put high quality food which they consume. In others there is a great deal of wastage.

I think there should be built into the program an evaluation of how effectively it is consumed, otherwise we are just feeding our consciences. It may be that this is a factor in why we have not shown the effect on the growth of the children.

I think the most important factor is that elementary-school age is a period of slow growth anyway, and that spurts, catch-up growth, is not likely to be impressive at that age as it is in infancy and adolescence.

Our evaluation did not include a significant number of adolescents where we might show better effect.

I expect that the number one factor is probably poor consumption and the other is that of course—also mentioned by Dr. White—that the school lunch is 5 days a week, during the days of school, which is about half the year. And it provides one-third of the recommended intake for that day.

We have no control over what happens to the rest of the days diet.

In our experience overseas in dealing with the poor, the degree of poverty is much greater than we ever see in this country. We have verified the fact that when we provide food for children in any controlled situation, consciously or subconsciously the family withholds food from that particular child at home on the assumption that he is getting food elsewhere.

I doubt that that is a big factor, but it is something we must look into. When we deal with 25-million children, the least we could do is try to measure how effective we are and what the deficiencies are.

Senator Taft. Perhaps more so as we move into the child development program and expanding on the day care.

Dr. Graham. Yes, where food may be even a good deal more important because this is a period of rapid growth, rapid development, in which food may be more vital.

Senator Taft. In that connection, is nutrition education then a desirable or vital complement to the use of supplements?

Nutritional Education

Dr. Graham. People look at nutrition education in two different ways: the traditionalist, the home economist, the dietitian brought up on the concept, well founded, of the basic food groups, feels that the school lunch program is an opportunity to inculcate these ideas into children.

The children perhaps if given a chance to speak, might say that under the circumstances the school lunch is used as an opportunity to force the eating habits of the adults on the children. Very often it creates rejection.

A poorly prepared traditional meal will often cause permanent dislike of a particular food item.

Need for "Nutrient Vocabulary"

Nutrition education should be teaching children what nutrients are, not foods which are sometimes dictated by pressure groups. The inclusion of certain foods in the "basic four" concept sometimes can be seriously questioned as to whether it is nutritionally desirable and yet we continue to include them and there is a great deal of pressure to include them.

We should not be teaching foods; meat, vegetables, fruits; we should be teaching nutrients, proteins, calories, vitamins, minerals and that these can be obtained in a variety of ways, rather than pushing certain food groups.

Senator Taft. Dr. O'Donovan, have you concluded that the supplement is completely safe and if a child is getting 100 percent of the recommended allowances, would he be harmed in any way by taking the supplement?

Dr. O'Donovan. Senator Taft, we are completely sure of the lack of harm to the youngster taking these products or these wafers as planned, i.e. one each school day.

When one talks about potential for toxicity in vitamins, we are concerned primarily with vitamins A and D, and then we are concerned only when there is excessive ingestion for protracted periods of time, of the order of months. As a matter of fact, in the instance of vitamin A, toxicity results only after daily dosage of the order of 20 to 30 times the recommended dietary allowances and for periods of 6 to 15 months before symptoms would become manifest.

The idea of intoxication from an isolated overingestion seems improbable. Similarly with respect to vitamin D, while the margin for toxicity or the therapeutic to toxic ratio is somewhat narrower, it would again be a matter of chronic protracted ingestion over a period of months, large doses of the order of five or more times the requirement, before manifestations would show. These are entirely safe when used as directed. It was with——

Senator TAFT. I wonder about your qualification that they must be "used as directed." How about excessive use above—maybe a child can become addicted to it.

EVIDENCE INDICATES SAFE FORMULA

Dr. O'DONOVAN. I think the problem with vitamin overdosage A and D has resulted from overzealous dosing of a child by a misinformed or neurotic parent. When in fact, hypervitaminosis A and D have on occasion been seen in adults, and once again, there were instances of neurotic individuals who were misusing or misunderstood vitamins and were taking more than they should have, in every instance using horrendously large doses of these vitamins.

Now, iron is an item, that we should give thought to. Certainly it has been appreciated since a report by Dr. Forbes in the British Medical Journal in 1947, that the result of ingestion of large amounts of iron by small children can have adverse consequences and there have been fatalities.

Every reported case of serious or fatal acute iron poisoning in children has resulted from access to adult dose iron formulations such as those recommended for the mother in the pre- and post-natal period. These have been, exclusively, medically recommended preparations in the form of tablets freely available to the public without prescription. These tablets, for the most part, contain 65 milligrams of elemental iron per tablet.

Now, the iron content of the therapeutic formulations that we are talking about here, for instance, and those which are commercially available, stand in contrast to the 10 milligrams of elemental iron contained in children's food supplements. This is the level as has already been mentioned which the NAS/NRC Food and Nutrition Board recommended as the daily allowance for children.

That level had been set as we mentioned for the children's supplements on the basis of a proposal put forth in the FDA hearings on foods for special dietary uses by W. Henry Sebrell who had been Chairman of the Committee on Revision of the Recommended Dietary Allowances, 1968.

This recommendation was supported by many leading nutritionists who testified at this hearing. A somewhat higher level, as a matter of fact, had been supported by the FDA.

EXCESSIVE IRON COMPOUND INGESTION

Now, fairly recently, as a matter of fact, within the past month, Dr. David Fisher and Stuart Finch, of Yale, have just reported on 27 children who were seen for excessive ingestion of iron compounds as single entity preparations at therapeutic dose levels. These were seen at the New Haven hospitals over the last 10 years.

These children were estimated to have ingested acutely between 400 and 3,000 milligrams of elemental iron. Only three of the 25 children who were admitted to the hospital—there were two just seen in the out-patient department and dismissed—three demonstrated, three of these 25 who were admitted were symptomatic. These three demonstrated irritability, nausea, diarrhea, and vomiting. None had evidence of systemic intoxication or evidence of circulatory collapse. All these patients recovered essentially with conservative therapy as opposed to the use of more drastic measures such as the intravenous administration of various chelating agents.

Now, all the children included in Fisher's report ingested iron preparations that had been given to mothers during or immediately after pregnancy. Dr. Fisher states:

> Our experience suggests that the literature overemphasizes the toxicity of acute iron ingestion, probably because of the tendency to report fatalities and not recoveries.

Meanwhile, we have made an intensive examination of the records of the National Clearing House for Poison Control Centers for the years 1969 and 1970 with respect to reported overingestion by children under age 5 years of all vitamin and iron preparations.

Now, parenthetically, it should be made very clear that the Poison Control Center data are reports of overingestion of a wide range of household substances. The National Clearing House does not consider vitamins or vitamin plus iron food supplements as "poisons."

Examination of these records has confirmed that the deaths associated with iron toxicity in small children have been associated exclusively with therapeutic iron preparations.

Further, our examination confirmed there was no case of serious harm associated with supplemental level vitamin-iron preparations in these records. Further, an examination was recently made by Dr. John Crotty of the National Clearing House of more than 90 percent of the Nation's death certificates which identify poisonings for the year 1968, certificates which identify poisonings as the cause of death. There were 10 deaths involving over ingestion of iron.

Again, adult therapeutic preparations were involved in every case. So I think that we have good evidence that we are dealing with a safe formulation.

Senator TAFT. Thank you very much.

Senator Bellmon has arrived and I would be glad to make the witnesses available for questions.

Senator BELLMON. Thank you, Mr. Chairman.

I regret I had to be away at one other meeting this morning. I would like to ask Dr. O'Donovan a question, perhaps he covered it, but I have just eaten one of the tablets that you prepared and I would like to say they are very tasty and I find them entirely palatable.

Suppose a child got into these and thought they were candy and ate 100 of them; would this hurt him?

Dr. O'DONOVAN. No, sir, in this age bracket there would be no problem at all.

Senator BELLMON. Which age bracket?

Dr. O'DONOVAN. School-age children and I would expect that they couldn't possibly eat 100 of them, if only because of their calcium content. I have no fears about that at all, sir.

Senator **Bellmon**. Well, let's assume we have a group of students who use these tablets all through the school year, perhaps for many years and then leave school for one reason or another and no longer get this supplement—will there be a dependency developed, or will the body lose its ability to synthesize vitamins?

NO POSSIBILITY OF DEPENDENCY SYNDROME

Dr. **O'Donovan**. Oh, no, Senator, there is no possibility of developing a dependency syndrome to vitamins. Certainly one would have expected that by virtue of taking the vitamins as a part of the School Lunch Program that an educational effect will have come about on that individual.

The individual would be more conscious of nutrition and see to it in his older years, more adult years, that he take appropriate care of his diet nutrition-wise.

Senator **Bellmon**. Do you feel it is necessary to have some—I guess I can say—synthetic supplement like this necessary? Couldn't a child be taught to eat foods that would give him the necessary balanced diet in the micronutrients that he needs.

Dr. **O'Donovan**. As was brought out earlier, Senator Bellmon, one of the great—there are several difficulties.

Senator **Bellmon**. I read your statement, yes. I know what you said.

Dr. **O'Donovan**. There are several difficulties; bulk of food and satiation limit, the amount of vitamin or micronutrient intake. There are losses of vitamins from the time of the cleaning of the foods——

Senator **Bellmon**. You have that in your statement, yes, but the point is that for everybody—our food is as good as it was 100-years ago before we knew what vitamins were.

Perhaps the problem lies with TV advertising and a lot of the pressures that are on the children. They eat a lot of potato chips and soda pop, rather than eat apples and drink milk and the good foods that are available.

It seems to me the approach may be to educate the children in nutrition, teach them to choose the right foods so they won't eat the wrong foods.

Dr. **O'Donovan**. Would you like to address that Dr. White?

Dr. **White**. I would like to comment first of all that vitamins by definition are not the things synthesized in the body.

Senator **Bellmon**. You mean to say we cannot live without vitamin pills?

Dr. **White**. We cannot live without swallowing vitamins from some source.

Senator **Bellmon**. But there are natural vitamins.

MORE CALORIES—LESS VITAMINS

Dr. **White**. In some foods, yes. The comment our food is as good today as it has ever been may not be true. We are consuming more and more calories that do not carry their weight in vitamins and minerals.

Senator **Bellmon**. Why is this?

Dr. **White**. Because there is so much sugar.

Sugar by occupying so much of the calorie space, to whatever extent it does, limits the calorie space that you have left for foods which will give the vitamins and minerals you need.

400 years ago, sugar as a commodity practically did not exist. Today, sugar as a commodity is a food additive in almost everything we eat to the point that it now represents a tremendous amount of our bulk and caloric intake per year.

Senator **Bellmon**. So we should teach the children not to eat sugar?

Dr. **White**. Yes.

Mr. **Young**. Could I comment, sir?

Senator **Bellmon**. Yes.

Mr. **Young**. You asked about a nutrition education program to go along with the schools. Many school systems do have nutrition education programs to go along with the school lunch and hopefully to tie in the School Lunch Program with nutrition education, teaching the children to eat the traditional foods.

BUREAU PROVIDES INFORMATION MATERIAL

We in the Vitamin Information Bureau provide materials for education purposes. We sell them, especially in quantity, but we also give away a lot of materials free which describe the role of vitamins in the body, sources of vitamins, and particularly the food sources of vitamins.

We have charts for use in schools which they have ordered. I have here a packet of copies of about 30 orders from various school systems. Individuals within the school systems have ordered materials from us.

As I mentioned, we in addition have given single copies of many of our materials free to teachers. If I may read this letter, it is very brief:

> I recently received some educational materials from you and wish to thank you for them. I find your wall chart entitled "Vitamins and Your Body" to be especially good. Would it be possible to get 14 of these charts so I can put them in each of my schools for the teachers to use?

Signed by the director of the school food service for that particular school system.

I think that, as I said and I would like to reiterate, there are many educational programs in the schools to tie in sources of nutrients with the School Lunch Program. It is not only in the classroom but in some of the schools that are able to have educational programs in the cafeterias or through the cafeteria service.

Dr. **White**. Senator, I would like to comment in regard to nutrition education. Just as our food supply is changing, the problem of nutrition education is changing. Today about 50 percent of the food that is consumed in this country is in some way manipulated, processed or otherwise prepared before it is made available to the consumer. It was relatively easy at one time when we dealt with simple agricultural commodities to say you consume some of this and some of the other and a good mixture, the chances are you will get all the micronutrients hidden among those foods at the same time you get your calorie and protein needs.

NEED FOR NUTRITION INFORMATION

But I defy anyone to know today what is the micronutrient content of a pizza. Now, pizza is perfectly good food, but it is a real problem to put that into a food group to do traditional nutrition education. We have to change somehow; first, to have the information available through labeling so it is possible to know what is in the food, and then to teach people that they have nutrients. They can't deal with the oversimplistic approach that has been used in the past, that is, of just saying you need food from food groups whatever number of groups you care to deal with. Some people say four, some five, and some seven and so on.

So in this period of transition when our food eating habits are changing rapidly, nutrition education will have to change, not only the amount of it but the whole concept which is presented.

Senator TAFT. At this time I am going to have to go to another committee meeting for a few minutes. I will turn over the Chair to Senator Bellmon.

I thank you all very much for your help in testifying.

Mr. YOUNG. Thank you, Senator.

Dr. O'DONOVAN. Senator Bellmon, if I may, I want to make very, very clear that we see no hazard to the overingestion, accidental or deliberate overingestion of this vitamin-iron formulation.

Dr. WHITE. One of the things we were considering in the problem here is the arithmetic that may be involved.

As Dr. O'Donovan suggested, the fat soluble vitamins like A and D will accumulate.

We were wondering what quantities would be involved. Well, it is possible, perhaps, that if somebody ate 2,000 or 3,000 of these in a period of about 4 or 5 months, that there might begin to be a problem of accumulating too much.

I think it is very unlikely that anybody would persist so as to consume that number.

Senator BELLMON. I don't want to give a wrong impression here, I don't want to go over the ground you have been over before, because, as you know, I wasn't here when you testified, but I might tell you that I believe strongly in taking food supplements, particularly when they are prescribed.

I might say, for many years I have taken vitamin pills and I think my health has been much better as a result, but they have been prescribed by a physician and they were taken according to his prescription.

I don't know if you can take these on a shotgun basis, if you can prescribe a pill needed by every child, regardless of the diet in school and away from school. But you have the feeling and programs, you agree it is possible to produce such a supplement, is that right?

Dr. O'DONOVAN. Yes, Senator.

VITAMIN FORTIFICATION

Dr. GRAHAM. Senator Bellmon, perhaps I can speak to your concern, which I appreciate, by giving you an example.

Rickets used to be rampant in this country—not in Oklahoma, because they have more sunlight, but in the northeastern United States, big cities particularly, until the early 1930's, when we discovered that vitamin D would prevent rickets, and we discovered fish oil was an excellent source of vitamin D.

The introduction of cod liver oil and other fish oils resulted in a significant reduction in the incidence of rickets.

But there was still a lot of rickets because mothers would forget to give the cod liver oil, children would spit it back at their mothers for a variety of reasons.

Senator **Bellmon**. I don't blame them.

Dr. **Graham**. Yes, it is a rather repulsive product.

Then, vitamin D was synthesized and we could dispense it in little drops that had no flavor.

Still there was rickets because this required someone remembering to give the vitamins—many times doctors forgot to prescribe it, or the mother to give it.

Finally, we put vitamin D in all milk and certainly in all infant formulas and vitamin D deficiency rickets, disappeared in this country.

The same is true of nutritional education. For us it is difficult to understand why some people don't like the things we like and which we treasure and appreciate.

We are used to eating almost subconsciously, now, a balanced diet. We drink orange juice for breakfast. I can't start the day without orange juice.

My youngest children don't, they find it tastes horrible and they prefer one of these orange drinks which has vitamin C in it.

The other fact related to this is that not everybody can afford orange juice, fresh oranges are very expensive. Orange juice concentrates require that you have a freezer to keep them in and require a certain amount of time to prepare.

As a result, many of the people who we are most concerned with don't consume it.

Modern Foods Need Balanced Fortification

The same can be said for a variety of natural sources of vitamins which we have no trouble consuming but we are dealing with a society that is in a rapid state of transition, who are turning more and more to engineered foods, convenience foods.

Until such day as all those foods are properly fortified in a balanced way by law, we are going to have an increasing problem. For instance, the potato is an excellent source of vitamin C. I doubt that the potato chip is. But children eat potato chips and young adults do. It is an entrenched habit and it has become an important part of their diet.

There is a vast difference between what we would like things to be and what they are. I think we have to recognize this, that this trend is inevitable, that a very significant percentage and a growing percentage of our population is depending more and more on these convenience foods which require much less time to prepare, which often are and always should be less costly in time and equipment and all things that go with our concept of the traditional meal.

This is a reality today, for the majority of the people in this country. It would be ideal from the esthetic point of view, looked at from our point of view, that people should get their vitamins and minerals from natural sources. The facts are different, unfortunately.

Senator **Bellmon**. This is in the nature of an observation, but one of the great problems we have for Government and for citizens of our country is the high cost of medical care, hospitalization and doctor bills and the like.

Do you, as a group, feel that if we could succeed somehow in causing our citizens to have better diets that we might somehow cut down on the cost of medical care for the population?

Dr. **Graham**. Quite honestly, no.

The present high cost has little to do with nutrient deficiencies.

What we are attempting to do now is prevent the development of deficiencies as this transition goes on and as we see a deterioration in quality of diet.

Left unchecked, this would result in appearance of clinical deficiencies.

But the high cost of hospitals today, which is a disgrace, would not be remedied by that—no more than would be the traffic problem in Washington.

Senator **Bellmon**. Wouldn't utilization of a better diet keep people out of the hospital?

Dietary Habits Can Alleviate Illness

Dr. **O'Donovan**. Certainly, I think so, sir, in terms of those of us who are prone to overeat, get overweight, ingest too much in the way of saturated fats, and so forth.

It is interesting to note that December of last year the Commission on Heart Disease Resources, which is a consortium of some 30 medical and scientific bodies in this country, issued a report which was published in "Circulation," the official journal of the American Heart Association, making specific recommendation about modifications in the diet of American men.

The recommendations went so far as to urge that we develop strains of beef cattle that are lean, rather than fat-laden; that we modify the fat content of our dairy products, and so on.

So in this sense one feels that a tremendous preventive medicine program can be launched with respect to the control of coronary heart disease in our population.

Probably one day we might reduce the load on the medical profession and on the hospitals in part through such measures.

Dr. **White**. I think the apparent difference here is that Dr. Graham was speaking to undernutrition—that is people failing to get certain nutrients and thus develop deficiency diseases.

Dr. O'Donovan is speaking to overnutrition. They are both malnutrition, poorly balanced nutrition. Most of the degenerative diseases, particularly of the cardiovascular system, seem to have a relationship to the overconsumption of fats and so on.

Senator **Bellmon**. Is there any relationship between nutrition and, say, respiratory diseases like pneumonia? If a person has a right balance of vitamins in his food, will he be less susceptible to the diseases that frequently put people in hospitals?

Dr. **White.** Pneumonia is an infectious disease and most likely the one reason people contract it is that they are overwhelmingly exposed to the causative organism.

On the other hand, an individual who is well fed, and in good physical condition otherwise, is certainly more likely to survive that a person who is underfed and otherwise in poor physical condition.

Now, that is, however, complicated by the fact that today we have antibiotics that can completely alter the course of the pneumonia provided that it is a pneumonia responsive to an antibiotic.

Senator **Bellmon.** It strikes me that people who do have good dietary habits and do have good food seem generally not to be ill.

Am I mistaken about that?

Dr. **Graham.** Senator Bellmon, I think in the case of the elderly, a good many of the very old people that we admit to hospitals and institutions on the assumption they are deteriorating are found to be malnourished. There is no question about that.

This is an immense social problem being discussed now, the failure to eat proper foods because they are no longer motivated to prepare them.

In my presentation, I emphasized we need to develop a whole variety of foods that are appropriate for these people and to their state in life. There is experimental evidence that vitamin A deficiency increases the susceptibility to certain respiratory infections and severity.

I do not think we can say there is evidence for such a situation in this country leading to such, but this is some of the things that could happen undoubtedly.

Senator **Bellmon.** I suppose the ideal situation would be to have a condition in which a person could live without illness or disease for a long time and not have to go to the hospital, but I doubt this is a practical possibility.

Dr. **White.** I am sure that is the dream of every physician because he knows intimately how bad it is to be terminally hospitalized and does not look forward to being in that position himself.

Senator **Bellmon.** To get back on the subject, how did you researchers arrive at the decision that a fruit-flavored wafer would be ideal, or should we have one that tastes like potato chips?

Flavors Make Product More Acceptable

Dr. **O'Donovan.** A number of considerations were brought to bear, Senator Bellmon. Number one, we certainly wanted to remove from the formulation the image of a medicine, a drug, or a pill-type product.

On the other hand, we wanted to eschew the impression that we were formulating a confection. We wanted as neutral a formulation, appearance-wise, as possible.

But in the effort to render the several bitter or ill tasting ingredients of vitamins and so forth, and iron necessary to make up this formulation, we had to do something about the masking of flavor and make it sufficiently palatable that it would indeed be acceptable in a positive way.

We found that fruit flavors are generally well suited to affording the type of flavor that will mask the undesirable tastes of the ingredients.

But primarly, we wanted to stay away from something that would leave the impression that the end product was a candy or a medicine.

Senator **Bellmon.** Well, are there any other possibilities as to the form or flavor that the tablets might take? Have you checked into others and discarded them?

Dr. **O'Donovan.** I am not fully aware as to how much has been done in that regard.

Do you know?

Mr. **Young.** In one of the discussions we considered a wafer.

Dr. **O'Donovan.** Well, you have a wafer here.

Mr. **Young.** I mean a cookie-like wafer that would have a consistency, perhaps, of a cookie, but I do not know of any developmental work on that.

Dr. **White.** There are all sorts of possibilities, Senator. Sometimes the reason is for other than acceptability that one selects a particular form. This form as we show it today has the advantage of being able to be manufactured at low cost and in very, very high numbers and with very good specifications on it, so it is a very dependable way to produce the product.

There are some flavors that will not mask well, will not cover well. On the other hand, there are an infinite variety available—I guess one could go to pepperoni, any number of flavors which are available which may have some potential if that were desirable.

Senator **Bellmon.** Are there other companies or competing products, or is there just one available or what is the situation? I should know, but do you all come from the Miles Laboratories?

Mr. **Young.** No, sir.

Senator **Bellmon.** Is Miles the only company doing the work?

Mr. **Young.** They have the prototype of the product; they have done the developmental work. This may not be the finished product, but it is an attempt to have a product that can be looked at.

Research Is Continuing

Dr. **White.** Other companies are looking at this area, and have variations as possible ways to accomplish the goal of supplying micronutrients.

Senator **Bellmon.** Go ahead.

Dr. **Graham.** I might add, Senator, that in my estimation this is certainly not the only solution; it may not be the ideal one. It is a solution to the problem as it stands today.

Actually, our Department of Agriculture, OEO, and the State of New Jersey, are supporting rather extensive research on the possibility of replacing the School Lunch Program with a series of engineered foods—with a variety of alternates. All of these would be fortified making unnecessary—in other words, they would contain the vitamins and minerals.

There is a great deal of work to be done, and I expect this will be the eventual solution. It will be a simple thing like a fortified peanut butter and jelly sandwich which would be an excellent food, better than a poorly prepared bean salad that children often leave on the plate.

I think this is the direction in which we are going, but it will be some years before we can make such solutions effective.

Senator BELLMON. I served for a time on Senator Hughes' committee on drug abuse and I remember more than one witness who came in and testified that apparently a desire for drugs was associated at least in some cases with deficiencies in the diet.

I am sure this is totally outside your field, but do you have any evidence that a child who is receiving proper nutrients has any less tendency to use drugs?

Dr. GRAHAM. There is one very important example in the world, and this is the consumption of cocaine by Indians in the Andes. They chew the coca leaf itself and not the extract. They do this to satisfy hunger and as such, it is a rather vicious habit in that it replaces food.

I have not seen any evidence of a scientific nature suggesting that this might be the case in this country, none at all. I think the hunger there is often of another nature.

Senator BELLMON. No, I do not think it is nutrition.

Assuming a child, though, has eaten a meal and suppose it has the amount of calories he needs and the amount of bulk he needs, but it is deficient in some of the micronutrients, does there remain a hunger, desire for something further?

Dr. GRAHAM. Unfortunately, not, sir. The only nutrient that man and other mammals have a specific craving for is salt. Other than that, they eat to satisfy hunger without recognizing deficiencies of micronutrients in the food.

Neither man nor animals will recognize deficiencies of other elements.

Senator BELLMON. You mean to say if a person has not had any green leafy vegetable or fresh fruit for several months, he will not have a hunger for this in his diet?

DEFICIENCIES OF MICRONUTRIENTS NOT RECOGNIZABLE

Dr. GRAHAM. Definitely not. The outstanding example is the alcoholic. Thousands of them are admitted to our hospitals with acute deficiency of protein and deficiency of the amino acid, tryptophan, or niacin, the vitamin. They cannot recognize this. They do not develop a specific craving.

Senator BELLMON. Are you all in agreement on this?

Dr. O'DONOVAN. Oh, yes, sir.

Dr. WHITE. I think you have to distinguish though, that you may dream of your mother's apple pie and wish you could have another piece of it, but that is not a hunger in the sense it would direct one to a food source where there is a specific nutrient need. There is no evidence that such exists.

Senator BELLMON. So unless we are trained otherwise, we might go through a cafeteria line and take only one item that you might particularly like, maybe nothing but potatoes.

Dr. White. That is true. As man evolved on this planet and ate the things that were available to him and around him, in ample supply, he used those things that were present.

It is interesting to note, for example—you were mentioning vitamins were not synthesized within the body, but would have to be taken in.

There is an interesting example with vitamin C, in that most other animals can make vitamin C, so that vitamin C is a necessary nutrient only in man and the guinea pig and other minor species. It is not a universal vitamin as most of the other vitamins are.

This ability to synthesize a needed chemical within the body was lost sometime in evolution, and it made no difference as long as man was eating enough berries and fruits so that he never was short of vitamin C as supplied by his food.

When he was put in an isolated situation on shipboard, and couldn't get the vitamin C, suddenly it became apparent that he did not have the ability to make it and he had to ingest it.

Would Tablets Alter Deficiency Trend?

Senator Bellmon. Dr. White, in the table that appears on page 5 of your statement, you show that as the age of the individual goes up from 1 year to 21 years that the dietary deficiency tends to become more pronounced; if I understand it, is that correct? I am curious to know if you have any evidence that this would happen if you were using the tablet that you are recommending?

Do you have any evidence that the tablets would change this trend toward dietary deficiencies as their age advances?

Dr. White. Well, these are dietary intake figures and if I determine that this is an individual's diet——

Senator Bellmon. This table says percent who failed to ingest.

Dr. White. Yes, if I fail to ingest the RDA, and I add needed quantities of vitamin and mineral to what I do ingest, then I ingest the RDA.

Senator Bellmon. But you show in the age bracket 15–21 that 70 percent are not getting the niacin as opposed to 4 percent in ages 10 through 12.

Now, if we were to use the tablet in the School Lunch Program, would you expect this to change some way?

Dr. White. Completely.

Senator Bellmon. In what way?

Dr. White. You would abolish this dietary deficiency.

Senator Bellmon. Of course 21-year-olds are not ordinarily in school.

Dr. White. That is true. If we cannot reach them we cannot help them. But based on what people were recorded as eating on a given day—see, this is dietary intake history.

If I look at the food that somebody eats in a day and know what is contained in the various components of it, then I can determine that there is not enough of this or that, and so forth.

So what this table is saying, is that 70 percent of the people seen between 15 and 21 years of age, did not have, in what they ate in the course of that day in which they happened to be looked at, that 70 percent of them did not have the recommended dietary allowance of thiamine.

If I add thiamine to that diet, I obliterate this data and bring everybody up to the recommended dietary allowances.

Senator BELLMON. If you extended your table to age 50, what percent at that age would you feel would have failed to ingest the RDA?

Dr. WHITE. At age 50?

Senator BELLMON. If we put the tablet in the School Lunch Program and when the individuals finish school, then what can we expect. Will they go back to this situation or will there be something to cause them to continue getting a better diet?

Dr. WHITE. Unless we teach them about nutrients and unless we get busy at labeling our foods properly, and fortifying them properly, we would not have solved that problem.

Senator BELLMON. I see. Well then, why, from the scientific standpoint, is the record better in the age bracket 1 through 12 than it is in the 15 to 21 age bracket? Is there some reason for that? Is it because they watch more television when they get to be 15 or 21?

CHANGES IN EATING HABITS

Dr. WHITE. There are changes in eating habits at these ages and Dr. Graham, who is a pediatrician, maybe ought to speak to that.

Dr. GRAHAM. I think this younger age group is more under the control of its parents, as to what they eat.

When they become teen-agers even at home—I have a 21-year-old daughter whose dieting is against my will and a 14-year-old who is learning from her and it is a constant battle to keep them eating adequately, because they are more concerned with their figure than they are with their nutrition.

I think this is a—for a variety of reasons—this is what they all encounter. The other factor is the teen-agers of today and children in colleges who honestly think we make a big production over eating and we waste a lot of time sitting down at a table and eating food. They are in a hurry. They have more interesting things to do, even if it is watching television.

But they are changing, and it is, I think, an irresistible trend, to the extent that they make less of a production over eating than we do; they may be laying the ground for not over-eating in later life as we do, and not having the constant battle against weight, which we all have, and against degenerative vascular disease and obesity based on our eating habits, high contents of dairy products, meat, and other foods which are considered good, but which have been identified as contributing to the high incidence of degenerative vascular disease.

I disagree with part of Dr. Brigg's statement that listed wheat flour as a poor food. That happens to be man's most important food and in many ways much healthier than meat, milk, and eggs.

Senator BELLMON. You do not know how much I appreciate that comment from you.

Dr. WHITE. I would like to say, Senator, that as individuals get older, they can consume fewer calories because they are less active, and we all fight that battle as we slow down a bit so that it is more difficult to get micronutrients.

Dr. Graham mentioned the diet problem, this is a particular problem with young females particularly in regard to iron. The American diet, on average, contains about 6 milligrams of iron per thousand calories. And it is recommended that the adult female of childbearing age get 18 milligrams of iron per day. Well, this is simple arithmetic, she needs 3,000 calories unless she skews her diet toward iron-rich foods in some extreme way.

If one deals with this arithmetic on the basis that she will maintain her weight on about 2,000 calories, then she has to eat about 1,000 calories too many per day to get 18 milligrams of iron. At that rate she will gain about a pound a week. Nobody will put up with that.

There are all sorts of resistances to that. Our food is short of iron and as it is short of other micronutrients. They need to be put in and there need to be decisions made as to where each should be put.

How much should be put, is it available, is it stable where you are putting it, and all that will have to be worked out for each kind of food with which we must deal.

Supplement Offers Stability

One of the advantages of the supplement is that the supplement is put all together and you know these nutrients are in there and they will stay there until they are consumed.

The stability is well known, and well understood.

Senator **Bellmon**. Well, gentlemen, let me say this testimony is extremely interesting and I think highly important and I assure you the committee and staff will give it every consideration as we draw up our future plans and any recommendation that we make to the full committee and to the Congress.

If you have anything further you would like to say, the record will be open and you can submit statements, or if you have anything you would like to say now you may, but I have no further questions.

Mr. **Young**. Thank you very much.

Senator **Bellmon**. Thank you.

The committee is in recess, subject to the call of the Chair.

(Whereupon, at 12:17 p.m., the Select Committee was recessed, to reconvene at the call of the Chair.)

APPENDIXES

Appendix 1.

MATERIAL SUBMITTED BY THE WITNESSES

FROM DR. JOSEPH M. WHITE

TABLE 1.—COMPOSITE OF DIETARY INTAKE SURVEYS PUBLISHED 1950–68

PERCENT WHO FAILED TO INGEST THE RDA

Age	Vitamin A	Thiamine	Riboflavin	Niacin	Vitamin C	Iron	Calcium
1 to 12	30	34	24	43	53	45	43
12 to 15	40	55	40	49	64	68	58
15 to 21	44	70	53	52	67	67	63
PERCENT WHO FAILED TO INGEST ⅔ RDA 0							
1 to 12	12	5	6	7	24	6	18
12 to 15	17	15	13	10	34	22	30
15 to 21	19	15	17	11	37	23	31

Note: Number of subjects included in data varies from 2,000 to 5,000 depending on standard, age group, and nutrient.

APPENDIX A

JOINT INDUSTRY FINDINGS ON THE NUTRITIONAL STATUS OF THE UNITED STATES POPULATION

From June 24, 1968 until May 14, 1970 the U.S. Food and Drug Administration held a rulemaking hearing on Foods for Special Dietary Uses, which foods include dietary supplements of vitamins and minerals. The major question in this hearing was the nutritional status of the American public, and the weight of the evidence presented indicated that problems are widespread. This evidence is summarized in the following pages.

In the succeeding discussion testimony and exhibits are identified by symbols used in the FDA hearings. To assist the reader, the names and titles of the witnesses whose testimony is cited have been set forth in full:

William H. Allaway, Ph.D.—Director of the Plant, Soil & Nutrition Laboratory, U.S.D.A., Ithaca, New York.

Zoe E. Anderson, Ph.D.—Associate Professor of Foods & Nutrition, San Diego State College.

Samuel G. Barton—Chairman of the Board, Market Research Corporation.

George M. Briggs, Ph.D.—Professor of Nutrition, School of Public Health, University of California at Berkeley, editor of The Journal of Nutrition Education.

Myron Brin, Ph.D.—Assistant Director of Clinical Nutrition, Hoffman-La Roche, Nutley, New Jersey.

Raymond H. Bunnell, Ph.D.—Section Chief & Biochemist, Food and Agriculture Products Development, Hoffman-La Roche, Inc.

Bacon F. Chow, Ph.D.—Professor, John Hopkins University, School of Hygiene & Public Health, Department of Biochemistry.

Robert E. Cooke, M.D.—Department of Pediatrics, Johns Hopkins Hospital, Baltimore, Maryland.

David B. Coursin, M.D.—Director of Research at Research Institute, St. Joseph's Hospital, Lancaster, Pennsylvania.

Thomas R. A. Davis, M.D.—Research Physician, Arthur D. Little, Inc.

Gladys A. Emerson, Ph.D.—Professor of Nutrition, School of Public Health, University of California, Los Angeles, California.

Lloyd J. Filer, M.D., Ph.D.—Professor of Pediatrics & Pediatric Nutrition, University of Iowa, College of Medicine, member of NAS/NRC Food and Nutrition Board.

Stanley Gershoff, Ph.D.—Professor, Department of Nutrition, Harvard University, School of Public Health.

Robert S. Goodhart, M.D.—Secretary, Committee on Medical Education, New York City; Adjunct Professor of Community Medicine, Mt. Sinai School of Medicine.

George G. Graham, M.D.—Associate Professor of Pediatrics, Professor of Human Nutrition, Johns Hopkins University.

Arthur Grollman, M.D., Ph.D.—Professor of Experimental Medicine, Southwestern Medical School, University of Texas.

Robert H. Harris, Ph.D.—Emeritus Professor of Nutritional Biochemistry and Full Professor of Department of Nutrition & Food Sciences, Massachusetts Institute of Technology.

Robert E. Hodges, M.D.—Professor of Medicine, University of Iowa.

M. K. Horwitt, Ph.D.—Professor of Biochemistry at St. Louis University Hospital.

Frank L. Iber, M.D.—Professor of Medicine at Tufts University.

Thomas H. Jukes, Ph.D.—Associate Director of Space Sciences Laboratory, University of California at Berkeley.

Harry G. Kimpel, Ph.D.—Director Bio-Med Technical Service, Carnation Research Laboratories, Van Nuys, California.

Willard A. Krehl, M.D., Ph.D.—Professor & Chairman of the Department of Preventative Medicine, Jefferson Medical College, Thomas Jefferson University.

Sheldon Margen, M.D.—Professor of Human Nutrition, Department of Nutritional Sciences, University of California at Berkeley.

Jean Mayer, Ph.D., D.Sc.—Professor of Nutrition at the School of Public Health of Harvard University, Chairman of the White House Conference on Food, Nutrition and Health 12/69; special consultant to the President on nutrition.

Olaf Mickelsen, Ph.D.—Professor of Biochemistry and Nutrition, Michigan State University.

Robert Olson, Ph.D., M.D.—Doisy Professor and Chairman of the Department of Biochemistry, Associate Professor of Medicine, St. Louis University School of Medicine.

Margaret Ross, Ph.D.—Professor of Nutrition at Simmons College.

Arnold E. Schaefer, Ph.D.—Director of the National Nutrition Survey, Chief of Nutrition Program of Division of Chronic Disease Programs in Regional Medicine Programs Service, Health Services & Mental Health Administration of U.S. Department of Health, Education and Welfare.

Herman A. Schwartz, M.D.—Professor of Medicine, University of California Medical School, Special Advisor on Committee of Regional Medicine Programs.

Bernard Schweigert, Ph.D.—Professor of Department of Food Sciences, Michigan State University.

Nevin S. Scrimshaw, M.D., Ph.D.—Professor of Health of Department of Nutrition and Food Sciences, Massachusetts Institute of Technology.

William H. Sebrell, M.D.—Director of Columbia University's Institute of Nutritional Sciences: Chairman, NAS/NRC Food and Nutrition Board Committee on Recommended Dietary Allowances (1965–1968).

Elmer L. Severinghaus, M.D.—Professor of Nutrition at Columbia University (1956–1965): Medical Consultant to the Vitamin Information Bureau.

Frederick J. Stare, Ph.D., M.D.—Chairman, Department of Nutrition, School of Public Health at Harvard University.

E.L.R. Stokstad, Ph.D.—Professor of Nutrition & Biochemistry Department of Nutritional Sciences, University of California at Berkeley.

Reinhardt Thiessen, B.S.—Nutrition Research Area Manager, General Foods Corporation.

Walter G. Unglaub, M.D.—Professor of Nutrition and Director of the Nutrition Section, School of Public Health & Tropical Medicine, Tulane University; Louisiana Director of the National Nutrition Survey (deceased).

Joseph J. Vitale, M.D.—Professor of Nutrition at Tufts University.

Ralph O. Wallerstein, M.D.—Clinical Professor of Medicine, University of California, Chief of Staff at Children's Hospital in San Francisco.

Joseph M. White, M.D.—Nutritional Consultants to Miles Laboratories, Inc.

Also cited in the following pages are several documentary exhibits. The following list shows the identifying numbers of these together with their bibliographical information:

P–651—Recommended Dietary Allowances, 7th edition (1968).

O–587–46—Davis, et al., "Review of Studies of Vitamin and Mineral Nutrition in the United States (1950–1968)", Journal of Nutrition Education, Vol. I, p. 41 (1969).

O–924–33—Statement of Arnold E. Schaefer before the Senate Select Committee on Nutrition and Human Needs (4/27/70).

O–36–19—Hodges, et al., "Nutritional Status of Teenagers in Iowa," American Journal of Clinical Nutrition 17:200 (1965).

P–764—USDA, Nutritive Value of Food Available for Consumption in the United States, 1909–1964, ARS 62–14 (January 1966).

P–765—USDA, National Food Situation, NFS–126 (Nov. 1968).

O–606–46—Gamble and White, "Vitamins and Minerals in Traditional Foods & Dietary Supplements—Report to Miles Laboratories, Inc. (10/21/69).

O–544–33—Bunnell, et al., Alpha Tocopherol Content of Foods," American Journal of Clinical Nutrition 17:1 (1965).

P–568—"Dietary Levels of Households in the United States, Spring 1965, ARS 62–17 (June 1968).

P–762—USDA, "Food Intake and Nutritional Value of Diets of Men, Women and Children in the United States, Spring 1965, ARS 62–18 (March 1969).

O–464–28—"An Analysis of Daily Food Consumption to Assess Whether Nutrient Intake Meets Dietary Standards," General Foods Marketing Research Services (September 1967).

O–468–33—June L. Kelsay, "A Compendium of Nutritional Status Studies Conducted in the United States, 1957–1967," Journal of Nutrition, Supp. 1, Part II, Vol. 99, No. 1 (9–69).

O–619–65—National Vitamin Foundation, How Well Nourished Are Americans?, (1961).

O–599–46—National Vitamin Foundation, How Well Nourished Are Americans?, (1963).

O–600–46—National Vitamin Foundation, How Well Nourished Are Americans?, (1966).

O–461–28—Reinhardt Thiessen, "Research Report—A Literature Survey of the Nutritional Adequacy of the American Diet 1956–1966," November 17, 1966.

H.E.–13—Statement of Arnold E. Schaefer before the Senate Select Committee on Nutrition and Human Needs (January 22, 1969).

Proposed Findings of Fact Concerning the Nutritional Status of the United States Population

Whether many of the sections of the Stayed Regulations before this hearing are reasonable depends to a great extent on the nutritional status of the United States population. Both Proponents and Opponents of the Stayed Regulations shared this view and offered testimonial and documentary evidence bearing on the subject. The facts disclosed by this evidence, since they affect many sections of the Stayed Regulations, are assembled at the beginning of the findings and are referenced as appropriate in the portions of the findings devoted to specific sections. The findings on the nutritional status of the population are divided into the following groups:

(*a*) Standards of Nutritional Adequacy, Consequences of Failure to Attain These Standards, and Techniques Used in Measuring the Degree to Which These Standards Are Attained.

(*b*) Vitamin and Mineral Content of the U.S. Food Supply and Factors Limiting Its Availability for Consumption.

(*c*) Existence and Identity of Groups of Persons Who Are Not Receiving Adequate Amounts of Vitamins and Minerals From the Diets They Consume.

A. STANDARDS OF NUTRITIONAL ADEQUACY, CONSEQUENCES OF FAILURE TO ATTAIN THESE STANDARDS, AND TECHNIQUES USED IN MEASURING THE DEGREE TO WHICH THESE STANDARDS ARE ATTAINED

1. The Recommended Dietary Allowances established by the NAS-NRC Food and Nutrition Board represent a consensus, based on the best scientific evidence available, as to the amounts of vitamins and minerals that should be ingested daily by healthy people. (WD-3A-Sebrell, p. 6: WD-46-Olson, p. 8; WD-46-Briggs, p. 12; WD-G-Ross, p. 5; WD-28-Thiessen, p. 91) These allowances represent levels of consumption of vitamins, minerals and other nutrients which "will maintain good nutrition in practically all healthy persons in the United States." (P-651, Purposes and Intended Uses)

2. These Recommended Dietary Allowances as revised in 1968 are as follows:

FOOD AND NUTRITION BAORD, NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL RECOMMENDED DAILY DIETARY ALLOWANCES,[1] REVISED 1968

[Designed for the maintenance of good nutrition of practically all healthy people in the United States]

	Weight		Height				Fat-soluble vitamins			Water-soluble vitamins							Minerals					
Age (years)[2]	Kg.	Lbs.	Cm.	In.	Kcal.	Protein (gm)	Vitamin A Activity (IU)	Vita-Min D (IU)	Vitamin E Activity (IU)	Ascorbic Acid (mg)	Folacin [e] (mg)	Niacin (mg equiv) [d]	Riboflavin (mg)	Thiamin (mg)	Vitamin B$_6$ (mg)	Vitamin B$_{12}$ (μg)	Calcium (g)	Phosphorus (g)	Iodine (μg)	Iron (mg)	Magnesium (mg)
Infants:																					
0 to ¼	4	9	55	22	Kg×120	[3] Kg×2.2	1,500	400	5	35	0.05	5	0.4	0.2	0.2	1.0	0.4	0.2	25	6	40
¼ to ½	7	15	63	25	Kg×110	[3] Kg×2.0	1,500	400	5	35	.05	7	.5	.4	.3	1.5	.5	.4	40	10	60
½ to 1	9	20	72	28	Kg×100	[3] Kg×1.8	1,500	400	5	35	.1	8	.6	.5	.4	2.0	.6	.5	45	15	70
Children:																					
1 to 2	12	26	81	32	1,100	25	2,000	400	10	40	.1	8	.6	.6	.5	2.0	.7	.7	55	15	100
2 to 3	14	31	91	36	1,250	25	2,000	400	10	40	.2	8	.7	.6	.6	2.5	.8	.8	60	15	150
3 to 4	16	35	100	39	1,400	30	2,500	400	10	40	.2	9	.8	.7	.7	3.0	.8	.8	70	10	200
4 to 6	19	42	110	43	1,600	30	2,500	400	10	40	.2	11	.9	.8	.9	4.0	.8	.8	80	10	200
6 to 8	23	51	121	48	2,000	35	3,500	100	15	40	.2	13	1.1	1.0	1.0	4.0	.9	.9	100	10	250
8 to 10	28	62	131	52	2,200	40	3,500	400	15	40	.3	15	1.2	1.1	1.2	5.0	1.0	1.0	110	10	250
Males:																					
10 to 12	35	77	140	55	2,500	45	4,500	400	20	40	.4	17	1.3	1.3	1.4	5.0	1.2	1.2	125	10	300
12 to 14	43	95	151	59	2,700	50	5,000	400	20	45	.4	18	1.4	1.4	1.6	5.0	1.4	1.4	135	18	350
14 to 18	59	130	170	67	3,000	60	5,000	400	25	55	.4	20	1.5	1.5	1.8	5.0	1.4	1.4	150	18	400
18 to 22	67	147	175	69	2,800	60	5,000	400	30	60	.4	18	1.6	1.4	2.0	5.0	.8	.8	140	10	400
22 to 35	70	154	175	69	2,800	65	5,000	--------	30	60	.4	18	1.7	1.4	2.0	5.0	.8	.8	140	10	350
35 to 55	70	154	173	68	2,600	65	5,000	--------	30	60	.4	17	1.7	1.3	2.0	5.0	.8	.8	125	10	350
55 to 75 plus	70	154	171	67	2,400	65	5,000	--------	30	60	.4	14	1.7	1.2	2.0	6.0	.8	.8	110	10	350
Females:	35	77	142	56	2,250	50	4,500	400	20	40	.4	15	1.3	1.1	1.4	5.0	1.2	1.2	110	18	300
12 to 14	44	97	154	61	2,300	50	5,000	400	20	45	.4	15	1.4	1.2	1.6	5.0	1.3	1.3	115	18	350
14 to 16	52	114	157	62	2,400	55	5,000	400	25	50	.4	16	1.4	1.2	1.8	5.0	1.3	1.3	120	18	350
16 to 18	54	119	160	63	2,300	55	5,000	400	25	50	.4	15	1.5	1.2	2.0	5.0	1.3	1.3	115	18	350
18 to 22	58	128	163	64	2,000	55	5,000	400	25	55	.4	13	1.5	1.0	2.0	5.0	.8	.8	100	18	350
22 to 35	58	128	163	64	2,000	55	5,000	--------	25	55	.4	13	1.5	1.0	2.0	5.0	.8	.8	100	18	300
35 to 55	58	128	160	63	1,850	55	5,000	--------	25	55	.4	13	1.5	1.0	2.0	5.0	.8	.8	90	18	300
55 to 75 plus	58	128	157	62	1,700	55	5,000	--------	25	55	.4	13	1.5	1.0	2.0	6.0	.8	.8	80	10	300
Pregnancy					+200	65	6,000	400	30	60	.8	15	1.8	+0.1	2.5	8.0	+.4	+.4	125	18	450
Lactation					+1,000	75	8,000	400	30	60	.5	20	2.0	+0.5	2.5	6.0	+.5	+.5	150	18	450

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[1] The allowance levels are intended to cover individual variations among most normal persons as they live in the United States under usual environmental stresses. The recommended allowances can be attained with a variety of common foods, providing other nutrients for which human requirements have been less well defined. See text for more-detailed discussion of allowances and nutrients not tabulated.

[2] Entries on lines for age range 22 to 35 years represent the reference man and woman at age 22. All other entries represent allowances for the midpoint of the specified age range.

[3] The folacin allowances refer to dietary sources as determined by *Lactobacillus casei* assay. Pure forms of folacin may be effective in doses less than ¼ of the RDA.

[4] Niacin equivalents include dietary sources of the vitamin itself plus 1 mg equivalent for each 60 mg of dietary tryptophan.

[5] Assumes protein equivalent to human milk. For proteins not 100 percent utilized factors should be increased proportionately.

3. The optimum level of human nutrition is the point where body tissues are saturated with the vitamins and minerals which are essential to life. The Recommended Dietary Allowances are set at this point for healthy persons in the case of most micronutrients. (WD–46–Olson, p. 13; WD–46–Severinghaus, p. 18)

4. Regular consumption of the Recommended Dietary Allowances of vitamins, minerals, and other nutrients will insure that tissue saturation is maintained in healthy persons. (Tr. 2989–90, Hodges; WD–46–Mayer, p. 29) Routine consumption of the RDA by all healthy individuals in the United States is a reasonable public health goal. (WD–46–Margen, p. 9; 28694, Jukes; WD–46–Severinghaus, p. 16)

5. It is sometimes said that the Recommended Dietary Allowances contain a "safety factor." By this it is meant that the allowances are set at a level sufficiently above the average requirement for a particular nutrient so as to cover the requirements of between 95% and 99% of the normal healthy population. (Tr. 7083, Hodges; WD–46–Olson, p. 7; Tr. 29466–67, Olson; Tr. 28688, Jukes; Tr. 28761, Briggs; Tr. 28865–66, Mayer; Tr. 26742, Stokstad; Tr. 30169–70, Goodhart; Tr. 29280, Stare; WD–G–Ross, p.5).

6. The current RDA for iron for women age 10–15 is 18 milligrams. (P–651, last page) Qualified nutritionists and hematologists are of the opinion that this figure is at or near the average requirement for this population group, and therefore the usual "safety factor" does not exist in the case of iron. (Tr. 29512, Olson; Tr. 28584, White; Tr. 29280, Stare; Tr. 28761, Briggs). Some experts are of the opinion that this figure is actually below the average requirement for this population group. (Tr. 28941, Tr. 28945–46, Unglaub; WD–46–Schwartz, p. 12; O–612–46, Table 2, p. 120; WD–46–Briggs, p. 16).

7. The absence of overt, acute deficiency diseases in a population does not demonstrate optimal vitamin and mineral nutrition. Malnutrition is of gradient nature, having three discrete stages. The first stage, caused by a diet which is deficient in one or more nutrients, involves the chemical desaturation of tissues. If a diet is less than adequate over a long period of time, stage two malnutrition, which involves physiological or metabolic aberrations, will occur. Continued dietary deficiencies can result in stage three malnutrition in which clinical manifestations, including symptoms and anatomical signs, appear. Eventually full blown diseases like scurvy, beri beri and pellagra will develop, and these can ultimately lead to death. (Tr. 3044, 3087–9, Hodges; O–600–46, p. 8; WD–46–Olson, p. 13, p. 24–25; WD–33–Brin, p. 4–7; WD–65–Goodhart, p. 7–8; WD–65–Stare, p. 6; Tr. 29474, Olson; WD–46–Margen, p. 9; WD–46–Severinghaus, p. 18; WD–46–Wallerstein, p. 7; WD–46-Unglaub, p. 20–21; WD–46–Schwartz, p. 3–4).

8. The presence of Stage 1 and Stage 2 malnutrition can have a detrimental effect on human behavior. Irritability, apathy, and loss of physical and mental efficiency can result. (WD–33–Emerson, p. 16–17; WD–46–Unglaub, p. 21; WD–33–Brin, p. 4–5, p. 8, p. 19–20; WD–46–Severinhaus, p. 17; WD–33–Coursin, p. 21–22; WD–65–Goodhart, p 8; WD–65–Chow, p. 3–4, p. 9).

9. The nutritional status of population groups can be measured by reference to dietary intake information, biochemical tests which measure circulating levels of nutrients in blood or urine, by anthropometric measurements, and through clinical examinations. (WD–46–Olson, p. 16–17; Tr. 29010–12, Tr. 29041–42, Margen; Tr. 29475, Olson; WD–G–Schaefer, p. 5; WD–65–Chow, p. 5) Ideally, a nutritional status study of whole population should include all of these investigations. (Tr. 29475, Olson; Tr. 29041–45, Margen; Tr. 28919, Unglaub).

10. Information concerning dietary intakes of vitamins and minerals is commonly evaluated against the RDA or some lower standard either related to the RDA or stated by those evaluating the intake data. (WD–46–Davis, p. 11; O–587–46, p. 42; O–468–33, p. 137; O–924–33, Attach. IV).

11. Since the Recommended Dietary Allowances are established to meet the needs of from 95% to 99% of the healthy population, it follows, at least theoretically, that a small percentage of this population will not meet its individual requirements by consumption of the RDA. An increasing perecntage of the population will fail to meet its requirements as consumption drops below the RDA by greater amounts. (WD–49–Stare, p. 23; Tr. 29466–67, Olson; Tr. 30170, Goodhart). If failure to ingest the RDA is found to exist within a significant segment of the population over a prolonged period, it is reliable evidence of malnutrition within this segment. (Tr. 29475, Olson; Tr. 28922–25, Unglaub; Tr. 28733–35, Briggs).

12. Information concerning circulating tissue levels of vitamins and minerals is commonly evaluated against standard criteria such as those published by the Intergovernmental Committee on Nutrition for National Defense (ICNND) or other researchers (e.g. Pearson's standards for interpreting urinary thiamine data). In general, such standards class particular ranges as "High," "Acceptable," "Fair," and "Low" or "Deficient." (0–587–46, p. 55).

13. The ICNND and other biochemical standards used in analyzing the nutrition survey data in the record are generally accepted and constitute the best standards now available for evaluating this data. In general, the "below acceptable" levels are known to be associated with poor diets and to be improved by the consumption of good diets. (WD–46–Gershoff, p. 11–12; 0–587–46, p. 42; WD–G–Schaefer, p. 7, p. 21).

14. More complicated biochemical tests, such as the "TPP effect of transketolase" assay development by Dr. Brin, measure whether or not vitamins are present in the body in sufficient amounts to perform metabolic functions at proper levels. (Tr. 6747, Hodges; WD–33–Brin, p. 10) The transketolase test has been used in survey work. (WD–33–Brin, p. 10–16) Failure to meet the criteria for these tests demonstrates metabolic derangement as a result of vitamin inadequacy. (WD–33–Brin, p. 10).

15. Anthropometric tests and clinical observation are also used to evaluate nutritional status. Evidence from anthropometric measurements that a particular population group failed to achieve heights and weights comparable to those found in presumably well nourished groups used to set standards would indicate that the below standard group may not be adequately fed. (WD–G–Schaefer, p. 6–7; Tr. 29012, Margen) Clinical observation can detect a number of signs thought to be associated with vitamin deficiency, for example, nasolabial seborrhea, angular lesions, cheilosis, swollen red papillae of the gums, and enlarged thyroid. (0–36–19, Table 2B, p. 204; Tr. 30157–60. Goodhart) In addition, through clinical examinations one can elicit symptoms and observe the anatomical signs of overt, acute deficiency diseases, such as scurvy, pellegra, or beri beri. (Tr. 2994, Hodges; WD–65–Goodhart, p. 7–8).

16. The successful use of the testing techniques listed in the previous findings requires that the investigators be highly trained and have at their disposal sophisticated laboratory facilities. This is especially true in the case of the biochemical and metabolic tests. All of these examinations are time consuming. As a consequence these tests are quite expensive. It has been estimated that if a person were to purchase a report of his nutritional status, it would cost between $150 and $300. The cost and time consumption, when coupled with the fact that such a report would remain valid for only a short time, constitute an effective barrier to the individual's being able to ascertain his personal nutritional status. These tests become practical only when used on an epidemiological basis. (WD–46–Margen, p. 10–13; WD–46–Schwartz, p. 5, p. 13–14; WD–46–Olson, p. 15–17; Tr. 3089–90, Tr. 6746–48, Tr. 6781–82, Hodges; WD–46–Wallerstein, p. 8–9; WD–33–Brin, p. 22; WD–33–Horwitt, p. 21–22).

B. VITAMIN AND MINERAL CONTENT OF THE U.S. FOOD SUPPLY AND FACTORS LIMITING ITS AVAILABILITY FOR CONSUMPTION

17. Evidence of record concerning the vitamin and mineral content of the United States food supply ranges from anectodotal testimony by an FDA witness about the wide variety of food available in supermarkets to detailed estimates of per capita nutrient availability developed by the Department of Agriculture. (Tr. 2996–3005, Hodges; Tr. 1843–45, Grollman; P–764; P–765).

18. The Department of Agriculture estimates of per capita nutrient availability in the United States food supply are known as "disappearance data." The official USDA publication containing the data, which is in evidence, states: "Estimates of per capita consumption of foods made by commodity specialists of Economic Research Service are sometimes referred to as 'disappearance data' because of the method by which they are derived. To estimate civilian consumption, these specialists use statistics on the Nation's food production, imports and exports, net changes in stocks, military takings, and amounts used for feed, seed, and nonfood products. Remaining food is considered to have 'disappeared' into civilian consumption." (P–764, p. 3, p. 8–9).

19. Nutrient content of the civilian food supply is calculated by the use of standard reference tables contained in USDA Statistical Bulletin No. 364 and

Agricultural Handbook No. 8. The estimated per capita nutrients available for consumption are maximum values, because "no deduction has been made in nutrient estimates for loss or waste of food in the home, use for pet food, or for destruction or loss of nutrients during the preparation of food." (P–764, p. 5, p. 9, Ft. Nt. 1 to Table 1, p. 4; WD–16–Briggs, p. 17; Tr. 11595, Schweigert) In addition, although modern processing techniques contribute much to stabilizing micronutrient content, the levels of certain micronutrients actually present in foods when they are consumed can be quite variable due to the combined effects of transportation, storage, and preparation. (Tr. 8197–200, Schweigert; Tr. 29036–38, Margen; WD–46–Mayer, p. 30; Tr. 29385–86, Stare; Tr. 30198–99, Goodhart; WD–33–Harris, p. 4–54).

20. The nutrients available per capita in 1968, the latest year for which there are data of record, were as follows:

Food Energy 3,200 cal.; Protein, 98 gm.; Fat, 150 gm.; Carbohydrate, 381 gm.; Calcium, 93 gm.; and Phosphorus, 1.51 gm.

Iron, 1.69 mg.; Vitamin A, 7,700 IU; Thiamin, 1.82 mg.; Riboflavin, 2.24 mg.; Niacin, 22.1 mg.; and Ascorbic Acid, 107 mg. (P–765, Table 12, p. 27).

21. The calorie content of the diet is an important limiting factor in the attainment of adequate vitamin and mineral intake. Department of Agriculture data showing per capita nutrient availability (P–765) show that calories are available at levels in excess of the RDA (P–651, last page). If an individual's diet contains not more than the RDA for calories, or, as in the case of reducing diets, less than the RDA for calories, it becomes more difficult to select foods which will furnish the RDA for micronutrients yet keep the diet within recommended caloric limits. This is a particular problem for women, whose calorie allowance is low, and becomes more aggravated if a substantial amount of calories in the diet are in the form of such foods as sugar or alcohol, which contain no vitamins or minerals. (WD–46–White, p. 10–13; WD–46–Olson, p. 14–15; O–606–46, Section V; Tr. 28582–84, Tr. 28606–07, White; WD–46–Severinghaus, p. 16–17; Tr. 28645, Severinghaus; WD–46–Briggs, p. 16–17, p. 20).

22. The consensus of qualified nutritionists and physicians who appeared in this proceeding is that the food supply of the United States does not contain adequate amounts of iron. (Tr. 3068–69, Hodges; WD–3A–Sebrell, p. 17; Tr. 26088–89, Sebrell; WD–46–Olson, p. 10–11; WD–46–Wallerstein, p. 12–13; WD–46–White, p. 13–14; WD–46–Schwartz, p. 6–7; Tr. 28713–14, Margen; WD–46–Margen, p. 7) In addition, the NAS–NRC Food and Nutrition Board states, "It is impractical to supply these needs [of adult women for iron] with ordinary foods, and iron supplementation is required." (P–651, p. 59).

23. The Department of Agriculture's annual disappearance estimates indicate that for most nutrients the peak per capita availability occurred during and immediately after World War II. The per capita availability of all the nutrients shown in he table set forth in Finding 20 has decreased since that time. (P–764, Table 1, p. 4; Table 12, p. 27).

24. No attempt was made by USDA in P–764 or P–765 to estimate the availability in the U.S. food supply of vitamin D, vitamin E, folacin, vitamin B_6, iodine, or magnesium although all are essential micronutrients for which the NAS–NRC Food and Nutrition Board has established Recommended Dietary Allowances. (P–651, last page.) However, expert testimony indicates that in some regions adequate amounts of iodine are not present in the food supply because of the soil in which it is grown. (Tr. 2616–17, Mickelsen; Tr. 247779, Ross; Tr. 11768–69, Schweigert; WD–46–Olson, p. 22; WD–46–Briggs, p. 35; Tr. 31900, Vitale; Tr. 12046, Allaway) Some witnesses questioned the adequacy of the levels of folacin, vitamin B_6, and magnesium available in the food supply. (WD–46–Olson, p. 10; WD–46–White, p. 8; Tr. 28575, White; WD–46–Briggs, p. 18; WD–33–Krehl, p. 9–10.) The evidence of record is not sufficient to establish the actual numerical levels at which these micronutrients occur in the U.S. food supply. Raymond H. Bunnel, Ph.D., a qualified nutritionist who appeared in this proceeding, conducted an analysis which showed that the vitamin E content of a variety of typical breakfast, lunch and dinner menus would average 11 I.U. per day, which is approximately 1/3 of the RDA for adult males and less than the RDA for everyone over the age of six. (0–544–33; WD–33–Bunnell, p. 3–5.) It was Dr. Bunnell's opinion that it would be difficult to achieve the adult RDA for vitamin E unless the diet contains reasonable amounts of fresh vegetable oils. (WD–33–Bunnell, p. 10.)

25. "Availability" of micronutrients in the food supply does not guarantee that individuals, or even large population groups, will in fact obtain the micronutrients

they need. A variety of foods must be selected and purchased, prepared properly, and actually consumed to insure adequate vitamin and mineral nutrition. (WD-33-Emerson, p. 14; WD-46-Mayer, p. 24; WD-46-Olson, p. 11; WD-46-Margen, p. 8.)

26. Actual food choices by consumers are primarily determined by taste, Tradition, ethnic or regional habits, economic circumstances, and other factors unrelated to the nutritional value of food. (Tr. 29460-61. Olson: WD-46—Briggs, p. 22-23; Tr. 26103, Sebell; WD-11-Graham, p. 20; WD-33-Horwitt, p. 18-19.) The appearance in today's marketplace of numerous new processed foods has complicated the problem of selecting a diet adequate in vitamins and minerals. (WD-33-Emerson, p. 16; Tr. 29037, Margen; WD-46-Mayer, p. 25-27; Tr. 28908-09, Mayer.) Particularly today, with such a wide variety of foods of varying micronutrient content available, it cannot be assumed that people generally can or will automatically select a diet adequate in vitamins and minerals. (WD-46-Margen, p. 18; WD-46-Briggs, p. 22-23; WD-46-Jukes, p. 5.)

C. EXISTENCE AND IDENTITY OF GROUPS OF PERSONS WHO ARE NOT RECEIVING ADEQUATE AMOUNTS OF VITAMINS AND MINERALS FROM THE DIETS THEY CONSUME

27. There is no reliable record evidence which confirms or even suggests that all members of the United States population (a) regularly consume the Recommended Dietary Allowances of vitamins and minerals, or (b) are free of evidence of malnutrition as defined in Findings 7 and 8. As is further detailed below, record evidence concerning food purchases, food intake, and biochemical testing of groups within the U.S. population overwhelmingly points to the conclusion that there are substantial numbers of people in this country who, despite whatever vitamins or minerals are theoretically "available" in the food supply, (a) fail to consume adequate levels of vitamins and minerals, and (b) exhibit biochemical evidence of malnutrition. (Finding 95 infra.)

28. The United States Department of Agriculture has conducted periodic surveys of household food purchases. The two most recent of these surveys were conducted in 1955 and 1965. They surveyed 7,500 households selected so as to be representative of the United States population as a whole. (P-568, p. 5.) The survey report concluded that, "Half of the households had diets that furnished the recommended allowances for the nutrients studied, and the other half had diets that failed to meet the allowance for one or more nutrients." (P-568, p.4.) The survey also found that one-fifth of the households purchased diets that furnished less than two-thirds of the 1964 version of the NAS-NRC Food and Nutrition Board's Recommended Dietary Allowances for one or more nutrients, which version is in most cases not greatly different from the current one. (P-568, p. 5; Tr. 2917, Hodges.) The record does not contain the underlying data from the USDA survey which would have to be analyzed in order to determine the precise effect of the RDA changes on the findings reported by USDA.

29. The 1965 Household Survey revealed that the following percentages of households failed to purchase the RDA or 2/3 of the RDA per "nutrition unit" for the following micronutrients:

	Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Ascorbic acid
Percent of household diets providing less than RDA	30	10	26	8	6	27
Percent of household diets providing less than ⅔ RDA	8	2	10	1	1	13

30. Despite the absence of precise data, it is clear that the Department of Agriculture figures on household purchases set forth above understate the extent to which households fail to purchase the RDA for iron. The Department used as its standard the 1964 RDA for iron for men, which was 10 milligrams. The 1964 RDA for iron for women of childbearing age was 15 milligrams, and the present RDA is 18 milligrams. The 1968 RDA for iron for young children is 15 milligrams, and for males 12-18 years of age it is 18 milligrams. Only the RDA for infants 0-2 months of age is less than 10 milligrams. Thus the standard of adequacy used in the report is lower than the 1968 RDA for many members of the households surveyed. (P-568, Ft. Nt. 12, p. 34; P-651, last page; WD-46-Briggs, p. 23-24).

31. The Department of Agriculture figures on household food purchases also tend to understate the failures to attain the RDA for each nutrient considered, because "no deductions have been made for discard of edible food." (P–568, Ft. Nt. 13, p. 34).

32. The report of the 1965 Household Survey made a comparison with the findings of the 1955 survey which revealed that there is a trend toward the purchase of less adequate diets. The report summarized this finding as follows, "Good diets, those meeting allowances for all seven nutrients, were found in 5 of every 10 households surveyed in 1965 and 6 of every 10 households in 1955." (p–568, p. 11).

33. Dr. Gladys Emerson, a qualified nutritionist, testified that consumption of whole grain cereals, potatoes, milk, butter and eggs had decreased. (WD–33–Emerson, p. 14) The changing patterns of consumption affect nutrient intake. As a result of the decrease in consumption of whole grain cereals, there has been a decrease in consumption of vitamin B_6, E, and thiamin. The decrease in consumption of dairy products means that there has been a decrease in consumption of riboflavin and vitamin A. (WD–33–Emerson, p. 15) Dr. George Briggs, a qualified nutritionist, agreed that people today are eating far less whole grains, potatoes and vegetables. He observed that presently 20% of the total U.S. diet is in the form of sucrose. (Tr. 28721, Briggs).

34. In its 1965 nationwide survey, the Department of Agriculture collected data on individual vitamin and mineral intakes, as well as household food purchases. The intakes of 14,500 women, men, and children were reported. (P–762).

35. These data on individual vitamin and mineral intakes indicate that the average diet consumed by many sex-age groups was not sufficient to provide the RDA of one or more nutrients. The following table summarizes these findings:

NUTRIENTS FOR WHICH 1968 RDA WAS NOT PROVIDED BY THE AVERAGE DIET

Age group	Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Ascorbic acid
Male and female:						
Under 1		×				
1 to 2		×				
3 to 5		×				
Male:						
9 to 11	×					
12 to 14	×	×		×		
15 to 17	×	×				
35 to 54	×					
55 to 64	×					
65 to 74	×					
75 and up	×		×		×	×
Female:						
9 to 11	×	×		×		
12 to 14	×	×	×	×		
15 to 17	×	×		×		
18 to 19	×	×	×	×		
20 to 34	×	×		×	×	
35 to 54	×	×		×	×	
55 to 64	×			×	×	
65 to 74	×	×	×	×	×	
75 and up	×	×	×	×	×	

36. The study drew the following conclusion: "With averages for several minerals and vitamins below the recommended allowances for some sex-age groups, it is safe to conclude that some persons within those age groups had diets in need of improvement. Where averages fell more than 30 percent below recommendations, as in calcium and iron for some sex-groups, the proportions of persons in those groups with diets in need of improvement were almost certainly high." (P–762, p. 10).

37. Dr. Thomas R. A. Davis, et al, made a "Review of Studies of Vitamin and Mineral Nutrition in the United States (1950–1968)," which combined and analyzed the dietary intake data from a number of studies, involving some 20,000 subjects, that had been conducted using compatible standards. The review concluded that from 31 to 57 percent of the individuals examined in the studies had diets which were not sufficient to furnish the RDA for the micro-nutrients considered—calcium, iron, vitamin A, thiamine, riboflavin, niacin, and vitamin C.

31 percent did not achieve the RDA for vitamin A, while 57 percent failed to achieve the RDA for iron. The percentages of failure for the other nutrients lay between these two bounds. Between 8 and 28 percent of the subjects investigated failed to consume diets which would furnish ⅔ of the RDA for the micronutrients considered. 8 percent failed to achieve ⅔ of the RDA for niacin, while 28 percent failed to achieve ⅔ of the RDA for calcium and for vitamin C. The percentages of failure for the other nutrients lay between these two bounds. Between 2 and 12 percent of the subjects investigated failed to consume diets which would furnish even ½ of the RDA for the micronutrients considered. 2 percent failed to achieve ½ of the RDA for thiamine and niacin. 12 percent failed to achieve ½ of the RDA for vitamin C. The percentages of failure for the other nutrients lay between these two bounds. (O–587–46, Table 1, p. 42, Figure 2, p. 43, text p. 43; WD–46–Davis, p. 12).

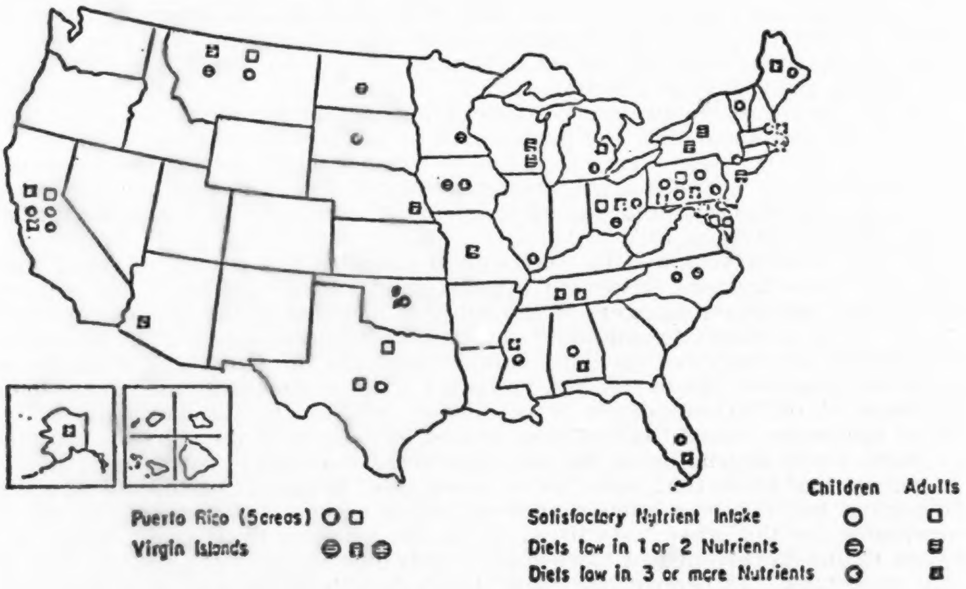
38. The Davis review examined studies published during the period from 1950 to 1968. It was noted that the percentages of failures to achieve the RDA, ⅔ RDA, and ½ RDA were higher in the more recent studies, leading the reviewers to conclude that "between approximately 1960 and 1968 a change for the worse occurred in the dietary intakes of all nutrients studied." (O–587–46, p. 43, Figure 4, 46; WD–46–Davis, p. 13).

39. The studies reviewed by Davis et al included the results of many biochemical investigations, involving approximately 10,000 subjects. The review found that significant numbers of the subjects included in the studies reviewed rated "below average" according to standard biochemical criteria. The biochemical information reviewed included data on hemoglobin, hematocrit, vitamin A, carotene, thiamine, riboflavin, and vitamin C. The studies evaluated these data in terms of ICNND standards or the Bessey and Lowry standards. Based on these, the review found that between 24 and 50 percent of the subjects had biochemical levels depending on the test considered that were "below acceptable." 24 percent had levels that were "below acceptable" in respect to vitamin A, while 50 percent had carotene levels that were "below acceptable." Percentages below acceptable for the other tests listed above fell between these two bounds. Between 13 and 38 percent had biochemical levels depending on the test considered that were "low." 13 percent had "low" levels for riboflavin, and 38 percent had "low" levels for carotene. Percentages that had "low" values for the other tests above fell between these two bounds. Between 3 and 24 percent of the subjects had biochemical levels that, depending on the test considered, were "deficient." 3 percent were "deficient" in regard to hemoglobin and hematocrit, and 24 percent were "deficient" in respect to riboflavin. Percentages that had "deficient" values for the other tests listed above fell between these two bounds. (O–587–46, p. 42, p. 45–46, Figure 7, p. 53; WD–46–Davis, p. 13).

40. A document entitled, "An Analysis of Daily Food Consumption to Assess Whether Nutrient Intake Meets Dietary Standards," was received in evidence as O–464–28. This report analyzed the dietary intake of vitamin A, vitamin C, and thiamine in comparison with the 1964 Recommended Dietary Allowances. The sample population included some 6700 individuals who were members of 2000 families selected to provide a cross section on all dimensions of the United States population. Because the methodology of the survey required that records be kept by subjects, illiterate households were not included in the sample. The intake of each individual was examined for 14 days, yielding data on consumption for approximately 94,000 "individual-days." (O–464–28, p. 2–3. app. B; WD–28–Barton, p. 11–20) The percentage of these individual-days which failed to achieve the RDA was then computed for the three vitamins being considered. It was found that daily intake was below the 1964 Recommended Dietary Allowances for vitamin A 60.7% of the time. Dietary intake of vitamin C was found to be less than the RDA 62.8% of the time, and daily intake of thiamine was below the RDA 37.2% of time. (O–464–28, p. 1; WD–28–Thiessen, p. 84–88).

41. A document entitled, "A Compendium of Nutritional Status Studies Conducted in the United States, 1957–1967," prepared by June L. Kelsay of the Nutrition Research Division, U.S. Department of Agriculture, was received in evidence as O–468–33. This compendium reviewed approximately 60 published studies, involving over 30,000 people, which included dietary intake investigations. "The numbers studied in the different age groups were 8,756 infants and preschool children; 2,871 children, 4,568 adolescents; 1,240 pregnant women, 3,685 adults; 1,379 older people; 5,721 families, and children in eight Indian boarding schools." (O–468–33, p. 124).

42. In 0–468–33, diets of studied groups were categorized as "low" in a nutrient if 1) more than 50% of the subjects consumed less than the Recommended Dietary Allowances, or 2) if more than 30% consumed less than three-fourths RDA, or 3) if more than 20% had less than two-thirds RDA, or 4) if more than 10% had less than one-half RDA, or 5) if the average nutrient intake was below the Recommended Dietary Allowance. On this basis, studies in which subjects had "low" intakes of none, one or two, or three or more nutrients were categorized and their location identified as follows:


Children
Adults
Puerto Rico (5 areas) ○ □
Virgin Islands
Satisfactory Nutrient Intake ○ □
Diets low in 1 or 2 Nutrients
Diets low in 3 or more Nutrients

The review states that, "In the majority of the studies there was a low intake of three or more nutrients." (O–468–33, p. 136–37).

43. The Kelsay "Compendium," (0–468–33), also reviewed some 50 published nutritional surveys, involving approximately 30,000 people in the United States, the Virgin Islands and Puerto Rico, which included clinical or biochemical evaluations of vitamin and mineral nutrition. The numbers studied in different age groups were: 4,625 infants and pre-school children; 2,985 children; 8,114 adolescents; 5,948 pregnant women; 1,476 adults; 1,587 older people; 5,301 individuals in families; 35 families; and children in eight Indiana boarding schools. (O–468–33, p. 124) The results reported in the studies tended to confirm the intake inadequacies indicated by the dietary studies. (0–468–33, p. 135–136).

44. Myron Brin, Ph.D., a qualified nutritionist, appeared in this proceeding and summarized a number of surveys of nutritional status in which he had particpted. (WD–33–Brm, p. 11–18. He concluded that the significance of the results of these studies was that, "At least with the populations that we surveyed, adolescents, senior citizens, and migrant workers, large portions of these groups were below adequate according to the best criteria in at least three of four nutrients—iron, thiamine, ascorbic acid, or riboflavin. In many cases up to ⅓ of the population studied was below adequate in at least one nutrient with smaller proportions in others, indicating that large groups of our population are essentially below adequate in nutrition." (WD–33–Brin, p. 18). He added that, "I consider findings in excess of 5% of the population being below adequacy in a particular nutrient as very significant from the standpoint of public health." (WD–33–Brin, p. 19).

45. W. A. Krehl, M.D., Ph.D., a qualified physician and nutritionist, appeared as a witness in this proceeding. In connection with the preparation of his testimony, Dr. Krehl undertook an extensive review of nutrition surveys that have been reported in the literature to determine "whether segments of the population are suffering from malnutrition or vitamin deficiencies." (WD–33–Krehl, p. 18). Dr. Krehl discussed the many studies he reviewed and concluded that

"taken as a group they show substantial reason for concern regarding the nutritional adequacy of the diets that people are actually consuming and regarding the capabilities of many individuals to select wisely and appropriately from the abundance of foods that surrounds them. In short, there is nothing to assure us in a search through the literature of nutritional surveys that all is well in regard to the nutritional status of the people in the United Saes." (WD-33-Krehl, p. 47-48).

46. Robert S. Goodhart, M.D., and Elmer L. Severinghaus, M.D., qualified nutritionists who appeared in this proceeding, sponsored in evidence a series of three documents entitled, "How Well Nourished Are Americans?" (O-619-65; O-599-46; O-600-46). These documents, which were authored by Dr. Goodhart, summarize, analyze, and comment on the significance of a number of surveys of nutritional status made in the United States. (WD-65-Goodhart, p. 5-6; WD-46-Severinghaus, p. 12, p. 14). It was Dr. Goodhart's conclusion that the studies examined "provide incontrovertible proof that a great many Americans of all ages and socio-economic brackets are subsisting on diets which fall substantially short of the Recommended Dietary Allowances in respect to one or more essential nutrients." (O-599-46. p. 25).

47. Mr. Reinhardt Thiessen appeared in this proceeding and summarized a review of 53 reports of nutrition surveys which he had conducted, in 1966, as one of his duties as Nutrition Research Area Manager at General Foods, Inc. (WD-28-Thiessen, p. 17-19, p. 74-75; O-461-28). On the basis of this review Mr. Thiessen reached the following conclusion: "the findings in a few of the reports did not disclose evidence of any appreciable nutritional deficiencies. However, these were the exception and in the aggregate, this study confirmed our earlier views including those found in a similar survey which we had made in 1955, that there are a considerable number of individuals in the United States receiving inadequate intakes of nutrients. Many of these individuals obtain less than the Recommended Dietary Allowances as set forth by the Food and Nutrition Board of the National Research Council. In particular, low intakes were often noted for vitamin C, calcium, and iron. There were numerous incidents of other nutrient deficiencies. As a matter of fact, we noted deficiencies at times for some individuals for protein, calcium, iron, vitamin A, thiamin, riboflavin, niacin, vitamin C, folic acid and even calories. Now, I want to emphasize that all of the individuals did not have all of these dietary deficiencies nor probably did any single individual have all of these deficiencies, but taking everything as a whole, we found at some time a deficiency of one or more of these nutrients which I have just recounted.

"It seemed obvious to us, from these data that the teenage girl seemed to be the poorest fed member of the family in respect to her intake of nutrients in relationship to her requirement for them. Another class of individuals which stood out is the age group over 50. The incidents of deficiencies in his group was also outstanding. Adults between the ages of 21 and 50 years was the next group in line as far as incidents of nutritional deficiencies was concerned. We found that the teenage boy was probably the best fed member of the family and this is probably because of the sheer mass of food which boys eat. They are very active athletically and they require a lot of calories and even though they snack a lot, just by their sheer volume of food intake, their diet is fairly well balanced." (WD-28-Thiessen, p. 75-76).

48. The Committee on Iron Deficiency of the American Medical Association's Council on Foods and Nutrition conducted a review of literature on iron deficiency in the United States, which has been published and received in evidence as O-612-46. The Committee investigated the adequacy of the iron supply ordinarily available from dietary sources in relation to the requirements of several groups. (O-612-46, p. 120) On the basis of the information available, it was concluded that "many adolescent girls and menstruating women have a borderline iron intake of 10 mg. or less each day. This value is consistent with the 1,500 to 2,000 calorie diet of sedentary women." (O-612-46, p. 121) In addition, it found that, "The requirements of infancy and of the latter half of pregnancy are clearly in excess of what may be obtained from an unfortified diet." (O-612-46, p. 121).

49. The Committee concluded that within certain groups the prevalence of iron deficiency and iron deficiency anemia is high. (O-612-46, p. 121-22, p. 124) These groups included women of childbearing age, infants and pregnant women.

Although the data reviewed did not permit the committee to fix percentages applicable to these populations on a nationwide basis, it did observe that a study of the hemoglobin levels of 73,783 women blood donors had found 12.6% of them to have levels below 12.3 gm/100 ml. blood. (O–612–46, p. 121) The studies of infants which were reviewed found in supposedly normal children incidences of anemia ranging from 8% to 64% (O–612–46, p. 122). Studies of pregnant women showed anemia in from 10% to 60%, depending on the study. (O–612–46, p. 121) The committee concluded that studies are "urgently needed to define more clearly the incidence of iron deficiency in the United States." (O–612–46, p. 124).

50. Robert E. Hodges, M.D., a qualified physician and nutritionist who appeared in this proceeding, and W. A. Krehl, M.D., Ph.D., (Finding 45), conducted a nutritional survey of a statistically randomized sample of the Iowa teenage population. (O–36–19) Preliminary findings, based on a survey of 2,015 students are reported in O–36–19 (p. 201) The survey was designed to run for five years, with approximately 2,000 students being examined each year; the results reported being those of the first year. (O–36–19, p. 200) Physical examinations were performed on each subject, biochemical tests were run, and dietary histories recorded. (O–36–19, p. 202).

51. The mean values for physical examinations and for biochemical determinations fell within the normal range, but a minority of the students was found to have values which were less than desirable. (Tr. 3020, Hodges; O–36–19, p. 203) Among the 2,015 students there were found 1,272 positive clinical signs. (O–36–19, table 2B, p. 204) The authors reported that "the findings in this sample are a little bit more reassuring than the actual facts justify." (O–36–19, p. 208) "The average values presented here conceal the abnormal values at each end of the biochemical curve. In addition, they may omit children from impoverished families." (O–63–19, p. 208) It is probable that the incidence of malnutrition within this latter group is higher than among the surveyed population. (Tr. 3127–28, Hodges).

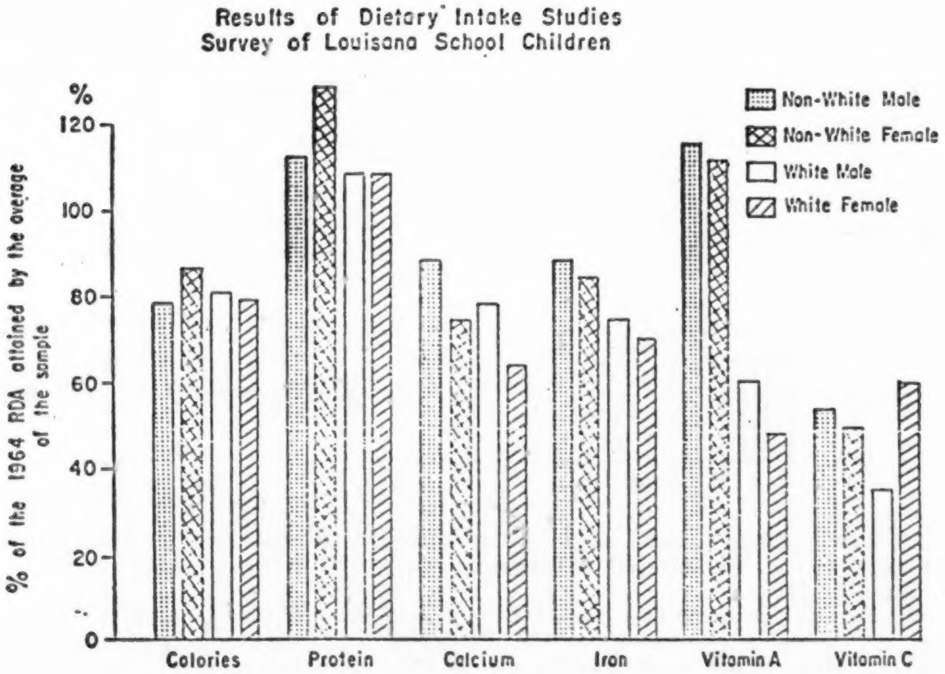
52. Dr. Hodges believes that poor eating habits constituted a major problem among the teenagers in the sample. (Tr. 3156 Hodges) The survey reported that, "Dietary faddism is not infrequent and restriction of food intake to a relatively small number of familiar and favorite items is common. A sizeable number of students, especially those who skip breakfast have less than the optimal intake of ascorbic acid." (O–36–19, p. 208).

53. Dr. Walter Unglaub, a qualified physician and nutritionist, who served as the Louisiana Field Director for the National Nutrition Survey, described in this proceeding a study of 3,000 Louisiana school-age children which he had conducted. (WD–46–Unglaub, p. 21–27) This study, which involved children between 10 and 16 years of age, was begun some eight years ago and continued over several years. The study was undertaken as a consequence of the ICNND surveys begin made in developing countries throughout the world, and was originally intended to develop data relating dietary intake to clinical and biochemical parameters in an apparently well nourished population. (WD–46–Unglaub, p. 21–22) Each child received a clinical examination employing the procedures and criteria of ICNND. Dietary intake information, blood samples, and urine samples were taken from children selected at random from the survey group. Altogether dietary intake data and blood biochemical data were obtained for over 600 subjects. (WD–46–Unglaub, p. 22–23).

54. The study found that the pattern and quality of meals consumed were poor. Many meals were skipped, particularly breakfast. Meal patterns in the home were often poor, as demonstrated by the comparison of the school-lunch and supper meal eaten at home. Consumption of green and yellow vegetables and of fruits and milk was approximately twice as great at the controlled school-lunch meal as at home. The consumption of carbonated beverages was ⅓ less at lunch than at home. (WD–46–Unglaub, p. 23).

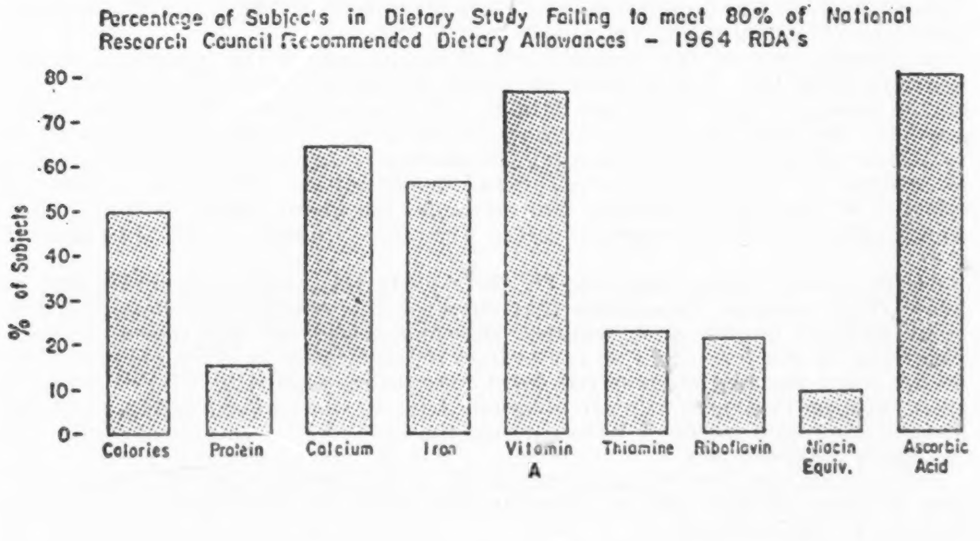
55. Nearly all children reported dietary intakes deficient in calories when compared with the 1964 version of the NAS–NRC Food and Nutrtion Board's Recommended Dietary Allowances. A large portion of the caloric intake was derived from carbonated beverages, candies and pastries. Vending machines present in the schools tended to encourage such consumption patterns.

56. Average intakes of calcium, iron, vitamin A, and ascorbic acid in the population sampled were well below recommended levels. The results in terms of the 1964 RDA's are illustrated in the following graph:

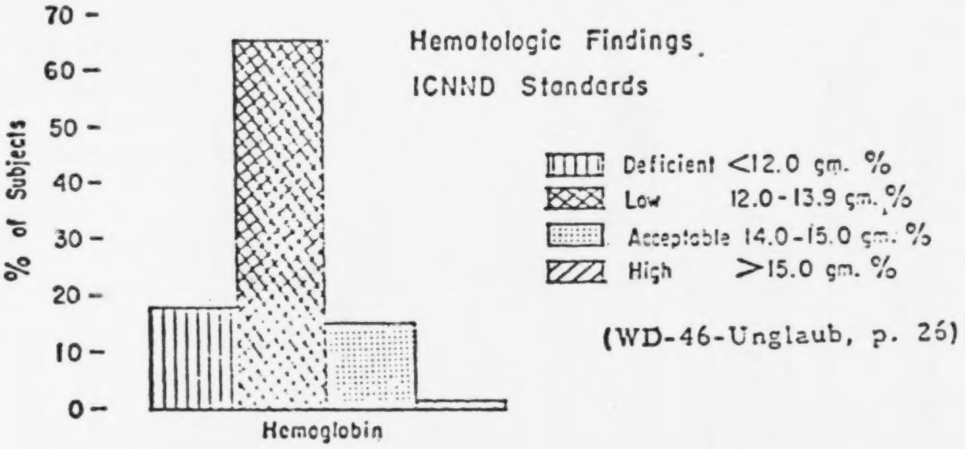


Some relatively high vitamin A intakes, chiefly in the non-white groups, were attributable to frequent consumption of sweet potatoes, a major Louisiana agricultural product. (WD–46–Unglaub, p. 23–25)

57. The survey also reported the percentage of intakes which failed to meet 80% of the recommended level. The results are shown in the following graph:



58. Biochemical data in this survey in general confirmed the dietary intake data. Anemia was a common finding. In some areas not a single subject met the ICNND criteria for "acceptable" or "high" categories as to hemoglobin levels. The hemoglobin results and the ICNND standards are shown in the following graph:



(WD-46-Unglaub, p. 26)

59. Low plasma ascorbic acid levels, defined as a concentration of less than 20 mg%, were encountered in approximately 12% of the sample, (WD-46-Unglaub, p. 27).

60. Serum carotene was classified as "deficient" or "low" in approximately 30% of the subjects, confirming the finding of low vitamin A intake in the dietary studies. "Low" is defined in the ICNND standard as less than .40 mk%, and "deficient" is defined as being less than .20 mg%. (WD-46-Unglaub, p. 27).

61. The record permits no definitive overall finding as to the economic level of the subjects of the various dietary and biochemical studies summarized in the foregoing findings. The record does contain a number of statements on this subject by the authors of studies which are in evidence.

62. The Department of Agriculture survey referred to in Findings 28-32 and Findings 34-36 sought to and did in fact report on a sample which included all income levels of the population. (P-568, p. 5, p. 8-9; P-762, p. 2) "Poor" diets were found at all income levels. (P-568, p. 3, p. 28).

63. Precise data on the income levels of populations in the individual studies underlying the literature reviews of record are not available. These studies did not, in general, report economic data in a precise or systematic fashion. However, Dr. Gershoff, one of the authors of the review by Davis et al, 0-587-46 (Findings 37-39), testified regarding the studies reviewed that "they are mostly on groups of people from small urban communities within easy traveling distance of land grant colleges. For example, the ghetto areas of large cities, Appalachia, or the Mississippi delta, were not studied." (WD-46-Gershoff, p. 8).

64. Dr. Robert Olson supported Dr. Gershoff in this respect, testifying that he knew from personal experience that some of the studies reviewed by Davis et al. were of middle class families. He summarized the situation as follows, "My view of the total data so far is that it is probably in the middle, and we do not know the real unemployed, hard core ghetto population who do not send their children to school, who are not employed; we don't have a really good idea of this group and we don't have perhaps the best idea of the upperclasses and the upper middleclasses.

But I think the data we have turned out to be accidentally quite representative. Because we miss the top segment, and really are missing the bottom segment." (Tr. 29473, Olson).

65. On the basis of his literature review (Finding 45), Dr. Krehl concluded that, "In every segment of the population, and even in the affluent segment one may find evidence of nutritional inadequacy, if only in latent form." (WD-33-Krehl, p. 48).

66. The Hodges and Krehl survey reported in Findings 50–52 investigated the health of Iowa teenagers. The authors reported that, "We selected Iowa as the location for this survey because it has a stable population, an agricultural heritage, an abundance of food and a high socioeconomic level. Poverty, as it exists in the slums of a large city, is virtually unknown in the state of Iowa although, of course, as in any community, there are a few underprivileged families." (O–36–19, p. 200.) The study used volunteers, and there was some evidence that those students from the lowest socioeconomic groups were disinclined to volunteer. (O–36–19, p. 208).

67. In reporting his survey of 3,000 Louisiana adolescents (Findings 53–60), Dr. Unglaub testified that these students were "generally from low income backgrounds." (WD–46–Unglaub, p. 23).

68. The Department of Health, Education and Welfare was authorized by the Partnership for Health Amendments of 1967 to conduct a comprehensive nutritional status survey "designed to determine the location and magnitude of malnutrition in the United States." (WD–G–Schaefer, p. 2). This survey, conducted under the direction of Dr. Arnold Schaefer, has been referred to in this proceeding as the National Nutrition Survey. (O–924–33, Attach. I; WD–G–Schaefer, p. 2).

69. The National Nutrition Survey is gathering data from 10 states: California, Kentucky, Louisiana, Massachusetts, Michigan, New York, South Carolina, Texas, Washington, and West Virginia. (H.E.–13, p. 3). However, the record in this proceeding contains data and conclusions for only two of these states, Louisiana and Texas. (O–924–33, p. 1–2).

70. The National Nutrition Survey collected data on some 13,373 individuals in Louisiana and Texas. (O–924–33, p. 2).

71. The sample examined was drawn by making a random selection among census enumeration districts in proportion to the number of families reported in the 1960 Census in the lowest one-fourth income group. Within each enumeration district a segment with an average of about 60 housing units was randomly selected. Finally, on the basis of a random start, an average of about 20 households in each enumeration district was chosen to be invited to participate in the survey. (H.E.–13, p. 11–12; 0–924–33, Attach. I, p. 3). Although the sample was chosen from areas indicated by the 1960 Census as being poor, not all of the individuals surveyed were poor. Family incomes ranged as high as $42,000 per annum. (HE–13, p. 12; WD–46–Unglaub, p. 3).

72. Testing was carried out using the protocol and procedures with some modifications, which Dr. Schaefer's group had developed while conducting nutrition surveys in undeveloped countries for the Interdepartmental Committee on Nutrition for National Defense (ICNND). A household questionnaire was used to gather data on family members including their name, age, sex, marital status, race, ethnic group, relation to family head, education, and work experience. Information on the size and construction of the home, type of sanitary facilities, and family income was also gathered. All members of each family were given physical and dental examinations, had their medical histories recorded, and had anthropometric measurements taken. In the case of those persons under 17 years of age, wrist x-rays were made to determine bone density and bone age in relation to chronological age. Subjects gave blood and urine samples for use in hematological and biochemical evaluations. Blood was analyzed for hemoglobin, hematocrit, total serum protein, serum albumin, plasma vitamin A, serum carotene, and serum vitamin C. In the case of those individuals having a hemoglobin level under 10 gms./100 ml., serum folic acid, serum vitamin B12, total serum iron, and iron binding capacity analyses were subsequently performed. Urine was analyzed for creatinine, thiamine, riboflavin, and iodine. Dietary intake data were collected for each of the individuals (WD–46–Unglaub, p. 3–5) These dietary data were secured through a review of the previous day's food consumption." (O–924–33, p. 6)

73. Income data were important to the survey insofar as they indicated the ability of subjects to purchase nutritious diets. This ability was dependent not only on family income but also on such factors as geographic area, family size, sex, and age of head of household. To take these factors into account a "Poverty Index Ratio" was employed. A subject's income places him at the poverty line if his Poverty Index Ratio (PIR) equals 1.00. A PIR smaller than 1.00 indicates that he is below the poverty line, and a PIR greater than 1.00 means he is above it. (O–924–33. Attach. II) On the basis of the Poverty Index Ratio, in Texas 66

percent of the households were below poverty level while in Louisiana 53 percent were below poverty level. (O-924-33, p. 3)

74. The racial, ethnic, sex, and age characteristics of the Texas and Louisiana survey samples are as follows:

RACE AND ETHNIC DISTRIBUTION OF SURVEY POPULATION

	Texas	Louisiana
Total number	7,306	6,067
Percent:		
White	12	23
Spanish speaking	52	....
Negro	36	77

(O-924-33, p. 2, table I.)

AGE AND SEX DISTRIBUTION OF SURVEY POPULATION

	Texas		Louisiana	
	Number	Percent	Number	Percent
Sex:				
Male	3,447	47	2,810	46
Female	3,859	53	3,257	54
Age:				
Less than 6 years	1,148	16	856	14
6 to 9 years	915	12	729	12
10 to 16 years	1,454	20	1,436	20
17 to 49 years	2,516	35	2,071	34
50 to 59 years	481	7	507	8
60 years and over	792	10	668	12

75. Data from the National Nutrition Survey indicate that substantial proportions of the surveyed populations in the states of Louisiana and Texas had diets which failed to provide amounts of one or more vitamins and minerals which the survey considered adequate. The standards of adequacy used in the evaluation of nutrient intake were developed by an ad hoc committee utilizing standards from the World Health Organization ICNND Manual and the Recommended Dietary Allowances from the NAS-NRC Food and Nutrition Board. Those used to evaluate micronutrient intake are as follows:

Calcium

Age:	*Mg/Day*
0 to 1 month	550
2 to 5 months	550
6 to 11 months	550
12 to 23 months	450
24 to 47 months	450
48 to 71 months	450
6 to 7 years	450
8 to 9 years	450
10 to 12 years:	
Male	650
Female	650
13 to 16 years:	
Male	650
Female	650
17 to 19 years:	
Male	550
Female	550
Adults	400
Pregnant-3rd trimester 400/mg/day plus basic requirements	
Lactating-500 mg/day plus basic requirements	

Iron

Age:	*Mg/Day*
0 to 1 month	10
2 to 5 months	10
6 to 11 months	10
12 to 23 months	15
24 to 47 months	15
48 to 71 months	10
6 to 7 years months	10
8 to 9 years	10
10 to 12 years:	
Male	10
Female	18
13 to 16 years:	
Male	18
Female	18
17 to 19 years:	
Male	18
Female	18
Adults:	
Male (20 years and over)	10
Female (to 55)	18
Female (55 on)	10
Pregnant and Lactating—No special allowance	——

VITAMINS B

Age	Thiamine	Riboflavin	Niacin
For all age groups including adults.	0.4 mg./1000 calories	0.55 mg./1000 calories	Including equivalent from Tryptophane 6.6 mg./1000 calories.

Note: Calories for each of above groups to be computed on average weights shown, except when actual weights are available.

ASCORBIC ACID—FOR ALL: 30 MG/DAY

Vitamin A

Age:	*International units*
0 to 1 month	1,500
2 to 5 months	1,500
6 to 11 months	1,500
12 to 23 months	2,000
24 to 47 months	2,000
48 to 71 months	2,000
6 to 7 years	2,500
8 to 9 years	2,500
10 to 12 years	2,500
>12 years	3,500

76. Under the above standards, intake amounts for some nutrient that are lower than the RDA are regarded as acceptable. This is true in the case of calcium, ascorbic acid, and vitamin A. (Finding 2; Finding 75).

77. The results of the National Nutritional Survey are presented in the evidence of record for "households" and for groups of individuals which the investigators anticipated to be vulnerable, including infants 0–3 years, adolescents 10–16 years, pregnant and lactating women, and persons 60 years of age and older. (O–924–33, Tables IV–VI; WD–46–Unglaub, p. 6).

78. With a few exceptions, the mean micronutrient intakes for these groups in each state were found to exceed 100% of the standards. The exceptions were iron, for which average consumption fell below the standard for all analyzed groups in Louisiana and for children 0–3 years, 10–16 years, and for pregnant and lactating women in Texas, and niacin, for which average intakes of children

10–16 years and pregnant and lactating women fell below the standards in Louisiana. (O–924–33, p. 7. Table V).

79. The report on this phase of the National Nutrition Survey stated, "average of adequacy for intakes of individuals do not reveal the proportion of those individuals who consume low and high amounts so the usefulness of such data is limited in delineating the problems of malnutrition. Group means may meet or exceed the mean reference standard considered to be adequate, while significant proportions of the group may be consuming diets falling considerably below the reference standard. With this in mind, it is cause for concern that several group means actually fell below the reference standard. This was especially true for iron intakes, where every group mean in Louisiana and those for 0–3 year old children, 10–16 year olds, and pregnant/lactating women in the Texas sample failed to meet the reference standard. An average of only 50 and 73 percent of the reference standard for iron was consumed by 0–3 year old children in Texas and Louisiana, respectively. This most widespread occurrence of inadequate dietary intakes is consistent with the biochemical findings in all age groups." (O–924–33, p. 7).

80. The National Nutrition Survey also summarized intake data from Texas and Louisiana on a county by county basis. The average intake for each category of individuals or households in each county was expressed as a percent of reference standards, with the results shown in the following table:

TABLE VI.—PERCENT OF COUNTIES IN TEXAS AND LOUISIANA HAVING MEAN NUTRIENT INTAKES FALLING BELOW REFERENCE STANDARDS

	Age groups							
	0 to 3		10 to 16		60 and over		Households	
	Texas	Louisiana	Texas	Louisiana	Texas	Louisiana	Texas	Louisiana
Nutrient:								
Iron	100	71	50	100	20	57	31	61
Vitamin A	30	0	29	21	20	41	16	11
Vitamin C	60	28	4	7	0	8	0	6
Niacin	60	35	50	63	10	24	4	6
Thiamine	10	7	21	21	20	57	23	10
Riboflavin	0	0	8	0	10	8	0	5
Calcium	10	0	58	14	0	8	4	10
Protein	0	0	4	7	30	73	8	5

The large percentage of counties with group means below these standards supports the evidence for dietary deficiencies of iron among all groups. In addition, there is evidence for low intakes of vitamin A and thiamine in all age groups and for vitamin C in infants in numerous counties. (O–924–33, p. 7–8, Table VI).

81. The percentage of people in the Texas and Louisiana samples that consumed diets that supplied less than 70 percent, from 70 to 100 percent and over 100 percent of the reference standards for iron, vitamin A, vitamin C, thiamine, and riboflavin was also computed and reported by the National Nutrition Survey as follows:

FOOD INTAKES PROVIDING SPECIFIED PERCENTAGES OF IRON

	Percent of subjects consuming		
	<70 percent standard	70–100 percent standard	>100 percent standard
Texas:			
Infants	75	14	11
Adolescents	46	19	35
Aged	32	20	48
Pregnant lactating	49	17	34
Households	30	24	46
Louisiana:			
Infants	78	5	17
Adolescents	66	17	17
Aged	46	19	35
Pregnant lactating	81	15	4
Households	42	24	34

FOOD INTAKES PROVIDING SPECIFIED PERCENTAGES OF VITAMIN A

	Percent of subjects consuming		
	<70 percent standard	70-100 percent standard	>100 percent standard
Texas:			
Infants	33	9	58
Adolescents	52	15	35
Aged	47	10	43
Pregnant lactating	63	6	32
Households	41	14	45
Louisiana:			
Infants	26	17	57
Adolescents	53	15	32
Aged	54	11	35
Pregnant lactating	54	15	31
Households	44	15	41

FOOD INTAKES PROVIDING SPECIFIED PERCENTAGES OF VITAMIN C

	Percent of subjects consuming		
	<70 percent standard	70-100 percent standard	>100 percent standard
Texas:			
Infants	56	11	33
Adolescents	35	9	56
Aged	32	10	58
Pregnant lactating	37	6	57
Households	27	10	63
Louisiana:			
Infants	53	11	36
Adolescents	45	9	46
Aged	46	8	46
Pregnant lactating	27	23	50
Households	29	9	62

FOOD INTAKES PROVIDING SPECIFIED PERCENTAGES OF RIBOFLAVIN

	Percent of subjects consuming		
	<70 percent standard	70-100 percent standard	>100 percent standard
Texas:			
Infants	16	5	79
Adolescents	27	17	56
Aged	32	19	49
Pregnant lactating	20	17	63
Households	19	21	60
Louisiana:			
Infants	3	4	88
Adolescents	16	17	67
Aged	24	19	57
Pregnant	12	19	69
Households	18	13	69

FOOD INTAKES PROVIDING SPECIFIED PERCENTAGES OF THIAMINE

	Percent of subjects consuming		
	<70 percent standard	70–100 percent standard	>100 percent standard
Texas:			
Infants	18	12	70
Adolescents	28	19	53
Aged	37	19	44
Pregnant lactating	34	17	49
Households	25	21	54
Louisiana:			
Infants	17	12	71
Adolescents	37	22	41
Aged	44	26	30
Pregnant lactating	19	27	54
Households	29	21	50

The data in these tables reveal that from 30 to 81 percent of all daily intakes, depending on the group considered, were low in iron. More than three-fourths of the children under age three in Texas and Louisiana ate diets providing less than 70 percent of the standard for iron. In Louisiana, 81 percent of the pregnant women reported diets that provided less than 70 percent of the standard for this nutrient. 42 percent of Louisiana households and 30 percent of Texas households reported food intakes inadequate in iron. From 26 to 63 percent of all intakes were low in vitamin A. Among the 10–16 year old age group and the pregnant women, more than half consumed diets which provided less than 70 percent of the standard for vitamin A. Between 27 and 56 percent of all intakes were low in vitamin C. More than one-fourth of the households in Louisiana and Texas were eating foods providing less than 70 percent of the standard for vitamin C. Reported food intakes show that 27 percent of the adolescents and 32 percent of the aged group in Texas were consuming less than the standard for riboflavin. Thiamin intake did not meet 70 percent of the standard in diets of 37 percent of the adolescents and 44 percent of the aged in Louisiana. (O–924–33, p. 8–9, Tables VII–XI).

82. The investigators were of the opinion that one day's food intake cannot be used to appraise the adequacy of an individual diet, since any particular day may not be representative of the usual food intake. Nevertheless, when daily food consumption of a large proportion of any population group fails to meet the standards required for adequacy, it is almost certain that many individuals within the group will consume poor diets regularly. (O–924–33, p. 8).

83. Biochemical tests for hemoglobin, plasma vitamin A, serum vitamin C, urinary thiamine excretion and urinary riboflavin excretion have been evaluated in the Texas/Louisiana phase of the National Nutrition Survey and these results tend to confirm the findings of widespread inadequate dietary intakes. (O–924–33, p. 10–15).

84. The standards used in evaluating biochemical data are an ad hoc modification of the guidelines contained in the ICNND Manual for Nutrition Surveys. These standards are as follows:

TABLE I.—GUIDELINES FOR CLASSIFICATION AND INTERPRETATION OF GROUP BLOOD AND URINE DATA COLLECTED AS PART OF THE NATIONAL NUTRITION SURVEY

	Classification category		
	Less than acceptable		
Determination	Deficient	Low	Acceptable
Hemoglobin, g./100 ml.:			
6 to 23 months	<9.0	9.0– 9.9	≧10.0
2 to 5 years	<10	10.0–10.9	≧11.0
6 to 12 years	<10	10.0–11.4	≧11.5
13 to 16 years, male	<12	12.0–12.9	≧13.0
13 to 16 years, female	<10	10.0–11.4	≧11.5
>16 years, male	<12	12.0–13.9	≧14.0
>16 years, female	<10	10.0–11.9	≧12.0
Pregnant 2d trimester	<9.5	9.5–10.9	≧11.0
Pregnant, 3d trimester	<9.0	9.0–10.4	≧10.5

TABLE I.—GUIDELINES FOR CLASSIFICATION AND INTERPRETATION OF GROUP BLOOD AND URINE DATA COLLECTED AS PART OF THE NATIONAL NUTRITION SURVEY—Continued

Determination	Classification category		
	Less than acceptable		
	Deficient	Low	Acceptable
Hematocrit, percent:			
6 to 23 months	<28	28–30	≧31
2 to 5 years	<30	30–33	≧34
6 to 12 years	<30	30–35	≧36
13 to 16 years, male	<37	37–39	≧40
13 to 16 years, female	<31	31–35	≧36
>16 years male	<37	37–43	≧44
>16 years, female	<31	31–37	≧38
Pregnant, 2d trimester	<30	30–34	≧35
Pregnant, 3d trimester	<30	30–32	≧33
Hemoglobin cone, MCHC, g./100 ml. RBC:			
All ages		.30	≧30
Serum iron, μg./100 ml:			
0 to 5 months	--		----
6 to 23 months	<30		≧30
2 to 5 years	<40		≧40
6 to 12 years	<50		≧50
>12 years, male	<60		≧60
>12 years, female	<40		≧40
Transferrin saturation, percent:			
0 to 5 months	----		----
6 to 23 months	<15		≧15
2 to 12 years	<20		≧20
>12 years, male	<20		≧20
>12 years, female	<15		≧15
Red cell folacin, ng/ml:			
All ages	<140	140–159	≧160–650
Serum folacin, ng/ml	3.0	3.0–5.9	≧6.0
Serum protein, g./100 ml.:			
0 to 11 months		<5.0	≧5.0
1 to 5 years		<5.5	≧5.5
6 to 17 years		<6.0	≧6.0
Adult	<6.0	6.0–6.4	≧6.5
Pregnant, 2d and 3d trimester	<5.5	5.5–5.9	≧6.0
Scrum albumin, g./100 ml.:			
0 to 11 months		<2.5	≧2.5
1 to 5 years		<3.0	≧3.0
6 to 17 years		<3.5	≧3.5
Adult	<2.8	2.8–3.4	≧3.5
Pregnant, 1st trimester	<3.0	3.0–3.9	≧4.0
Pregnant, 2d and 3d trimester	<3.0	3.0–3.4	≧3.5
Scrum vitamin C, mg./100 ml.:			
0 to 11 months			
≧1 year	<0.1	0.1–0.19	≧0.2
Plasma carotene, μg./100:			
0 to 5 months		<10	≧10
6 to 11 months		<30	≧30
1 to 17 years		<40	≧40
Adult	<20[2]	20–39	≧40
Pregnant, 2d trimester		30–79	≧80
Pregnant, 3d trimester		40–79	≧80
Plasma vitamin A, μg./100 ml.:			
0 to 5 months	<10	10–19	≧20
0.5 to 17 years	<20	20–29	≧30
Adult	<10	10–19	≧20
Urinary thiamine, μg./g creatinine:			
1 to 3 years	<120	120–175	≧176
4 to 6 years	<85	85–120	≧121
7 to 9 years	<70	70–180	≧181
10 to 12 years	<60	60–180	≧181
13 to 15 years	<50	50–150	≧151
Adult	<27	27–65	≧66
Pregnant, 2d trimester	<23	23–54	≧55
Pregnant, 3d trimester	<21	21–49	≧50
Urinary riboflavin, μg./g creatinine:			
1 to 3 years	<150	150–499	≧500
4 to 6 years	<100	100–299	≧300
7 to 9 years	<85	85–269	≧270
10 to 15 years	<20	70–199	≧200
Adult	<27	27–79	≧80
Pregnant, 2d trimester	<39	39–119	≧120
Pregnant, 3d trimester	<30	30–89	≧90
Urinary iodine, μg./g creatinine	<25	25–49	≧50

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[1] Excessively high levels may indicate abnormal cinical status or toxicity.

[2] May indicate unusual diet or malabsorption.

85. The following table contains the results of the tests of hemoglobin levels:

HEMOGLOBIN LEVELS

	Texas		Louisiana	
Total number	3,265		4,346	
Percent unacceptable:				
Total	20		41	
Male	22		46	
Female	18		37	
	Male	Female	Male	Female
Poverty status:				
Above poverty	20	14	40	39
Below poverty	22	20	46	42
Ethnic group:				
White	10	7	46	32
Spanish speaking	23	19		
Negro	19	19	46	39
Age:				
Less than 6 years	13	9	40	35
6 to 9 years	12	9	50	48
10 to 16 years	16	13	46	34
17 to 49 years	29	25	42	42
50 to 59 years	30	19	45	21
60 years and over	44	19	59	34

Anemia is one of the major problems encountered in the National Nutrition Survey. The hemoglobin level in the blood is a commonly used test to diagnose anemia. Low hemoglobin levels indicating anemia were found to be a major nutritional problem at all income levels in both Louisiana and Texas. No differences in the prevalence of anemia were observed between ethnic or racial groups in Louisiana. In Texas, Spanish-speaking and Negro groups, both male and female, had a prevalence of unacceptable hemoglobin levels approximately twice that of the white groups. All age groups in both states had high prevalence rates of unacceptable hemoglobin levels. (O–924–33, p. 11–12, Table XV) In Louisiana, investigators are sure the major cause of anemia is iron deficiency. (WD–46–Unglaub, p. 16).

86. The following results were found for plasma vitamin A:

PLASMA VITAMIN A LEVELS

	Texas		Louisiana	
Total number	2,960		3,743	
Percent unacceptable:				
Total	41		15	
Male	48		18	
Female	35		12	
	Male	Female	Male	Female
Poverty status:				
Above poverty	37	26	15	12
Below poverty	52	37	18	10
Ethnic group:				
White	32	20	19	10
Spanish speaking	50	40		
Negro	51	34	18	13
Age:				
Less than 6 years	79	80	40	45
6 to 9 years	82	78	33	33
10 to 16 years	68	66	19	16
17 to 49 years	9	12	1	1
50 to 59 years	1	8	0	1
60 years and over	7	3	1	1

41 percent of the subjects in Texas and 15 percent of the subjects in Louisiana were found to have unacceptable levels of plasma vitamin A. The prevalence of unacceptable levels of plasma vitamin A decreased as income increased, but was not confined to those below the "poverty level." For example, in Texas the prevalence of unacceptable levels in individuals living in households with a Pov-

erty Income Ratio (PIR) less than 0.75 was 45 percent while for those with PIR of 1.50 and over it was 26 percent. A subject's income places him at the poverty line if his PIR equals 1.00. A PIR smaller than 1.00 indicates that he is below the poverty line, and a PIR greater than 1.00 means he is above it. (O–924–33, p. 12, Table XVI, Attach. II).

87. The following results were found for serum vitamin C:

SERUM VITAMIN C LEVELS

	Texas		Louisiana	
Total number		2,577		3,793
Percent unacceptable:				
Total		12		14
Male		12		15
Female		12		13
	Male	Female	Male	Female
Poverty status:				
Above poverty	12	10	16	16
Below poverty	11	12	11	8
Ethnic group:				
White	19	17	15	18
Spanish speaking	10	8		
Negro	13	17	15	12
Age:				
Less than 6 years	9	11	10	12
6 to 9 years	11	10	8	10
10 to 16 years	13	13	12	10
17 to 49 years	12	13	24	16
50 to 59 years	11	11	24	12
60 years and over	14	7	25	13

Twelve percent of the total population surveyed in Texas and 14 percent in Louisiana had unacceptable serum levels of vitamin C. In Texas, no income influence was observed, while in Louisiana the prevalence of unacceptable values was higher in the above poverty groups. (O–924–33, p. 13, table XVII).

88. The data from the urinary thiamine tests reveal the following:

URINARY THIAMINE EXCRETION LEVELS

	Texas		Louisiana	
Total number		2,984		505
Percent unacceptable:				
Total		10		10
Male		13		8
Female		9		10
	Male	Female	Male	Female
Poverty status:				
Above poverty	11	8	8	10
Below poverty	13	10		3
Ethnic group:				
White	12	7	18	8
Spanish speaking	19	5		
Negro	18	13	5	11
Age:				
Less than 6 years	6	3		
6 to 9 years	9	11		
10 to 16 years	22	15		
17 to 49 years	8	6		
50 to 59 years	9	7		
60 years and over	11	8		

Ten percent of the overall sample had unacceptable urinary thiamine levels. No consistent relationship to income was found. The highest prevalence of unacceptable levels is clustered in the individuals 10–16 years of age. (O–924–33, p. 13–14, table XVIII).

89. The final biochemical test for vitamin adequacy for which data have been analyzed is the urinary riboflavin test. The results of this are as follows:

URINARY RIBOFLAVIN EXCRETION LEVELS

	Texas		Louisiana	
Total number	3,040		516	
Percent unacceptable:				
Total	21		16	
Male	22		20	
Female	21		13	
	Male	Female	Male	Female
Poverty status:				
Above poverty	17	18	25	17
Below poverty	22	22	24	15
Ethnic group:				
White	12	13	24	15
Spanish speaking	19	19		
Negro	28	25	18	13
Age:				
Less than 6 years	28	31		
6 to 9 years	24	30		
10 to 16 years	29	32		
17 to 49 years	12	14		
50 to 59 years	12	9		
60 years and over	9	11		

The survey reported that in Texas there are slightly higher rates of unacceptable riboflavin in the population below poverty. One-fifth of the total population in Texas had unacceptable levels. (O–924–33, p. 14, Table XIX).

90. The number of persons with multiple unacceptable values has also been determined in the Texas phase of the National Nutrition Survey. Using the six basic determinations, hemoglobin, serum albumin, serum vitamin A, and vitamin C, and urinary riboflavin and thiamine, over one-third (35 percent) of the survey population in Texas was observed to have two or more of these six biochemical levels in the unacceptable range. Other results are as follows:

PATTERN OF BIOCHEMICAL FINDINGS IN TEXAS SURVEY POPULATION (AGE)

Age group	Number	Both sexes	Percent with 2 or more unacceptable biochemical values	
			Male	Female
1 to 9 years	206	49	31	46
10 to 12 years	185	40	43	36
13 to 16 years	314	54	54	55
17 to 59 years	562	25	23	24
60 years and over	201	27	37	18
Total (all ages)	1,368	35	40	32

91. The following table shows a distribution of the multiple unacceptable biochemical findings by poverty status of the survey subjects. A subject's income places him at the poverty line if his Poverty Index Ratio equals 1.00. A PIR smaller than 1.00 indicates that he is below the poverty line, and a PIR greater than 1.00 means he is above it.

PATTERN OF BIOCHEMICAL FINDINGS IN TEXAS SURVEY: ETHNIC AND POVERTY STATUS

Poverty income ratio		Percent with 0–3 or more unacceptable biochemical values[1]			
All ethnic group	Number	0	1	2	3 or more
0.00 to 0.49	319	20.1	35.4	28.4	16.3
0.50 to 0.99	564	22.7	42.9	23.9	10.4
1.00 to 1.99	376	25.5	42.1	22.6	9.8
2.00 and over	109	30.0	45.9	18.3	2.8
All incomes	1,368	23.7	41.2	24.1	11.0

[1] Only persons with all 6 determinations completed are included; hemoglobin, serum alumen, plasma vitamin A, serum vitamin C, urinary riboflavin and urinary thiamine.

The table shows that findings of multiple unacceptable values were approximately twice as frequent among subjects having a PIR of less than .50 as among subjects having a PIR of 2.00 or larger. However, even among this latter group, 21.1 percent of the subjects had multiple unacceptable values. (O–924–33, p. 10, Table XIII, Attach. II).

92. The data have not been analyzed to determine the significance of observed relationships between dietary intake and pertinent biochemical observations. However, consistent trends appear. As an example, comparisons between the intakes of several nutrients with the percent of the appropriate biochemical values which fall in the unacceptable range are given in the following tables for households:

COMPARISON OF DIETARY DATA FROM HOUSEHOLDS AND BIOCHEMICAL OBSERVATIONS: LOUISIANA

Nutrient	Dietary			
	Average intake	Mean percent adequacy	Percent of diets providing <50 percent of standard	Biochemical percent unacceptable
Hemoglobin (iron)	[1] 12.6	97	32	41
Vitamin A	[2] 4,948	155	37	15
Vitamin C	[1] 68	202	25	14
Serum protein (protein)	[3] 80	146	18	
Thiamine	[1] 1.45	136	22	10
Riboflavin	[1] 2.81	210	13	16
Niacin	[1] 18.0	132	21	
Calcium	[1] 738	158	20	

[1] Milligrams.
[2] International units.
[3] Grams.

COMPARISON OF DIETARY DATA FROM HOUSEHOLDS AND BIOCHEMICAL OBSERVATIONS: TEXAS

Nutrient	Dietary			
	Average intake	Mean percent adequacy	Percent of diets providing <50 percent of standard	Biochemical percent unacceptable
Hemoglobin (iron)	[1] 14.0	109	21	20
Vitamin A	[2] 5,178	171	35	41
Vitamin C	[1] 59	214	24	12
Serum protein (protein)	[3] 84	150	13	10
Thiamine	[1] 1.33	146	18	10
Riboflavin	[1] 1.77	149	15	21
Niacin	[1] 18.9	137	16	
Calcium	[1] 597	132	20	

[1] Milligrams.
[2] International units.
[3] Grams.

These comparisons show that a substantial percentage of the people may consume diets which do not meet even 60 percent of the reference intake standards, although the mean intake for the total group may be considerably above the reference standard level. The occurrence of low biochemical levels among a substantial percentage of the subjects supports the premise that many of the individuals in the sample fail to meet their nutrient needs day after day. (0–924–33, p. 15, Tables XXV, XXVI).

93. The National Nutrition Survey looked for approximately forty different lesions as part of physical examination which subjects were given. Clinical lesions appear only after prolonged periods of poor food intake or after a shorter period of extremely limited food intake. In Louisiana, approximately one in three adults and one in ten children under the age of six had one or more clinical lesions. In Texas the Spanish-speaking and Negro populations had a slightly higher prevalence of individuals with one or more clinical lesions than did white popu-

lations. A part of the pediatric examinations was a series of body measurements and a hand-wrist x-ray to determine growth and development. Heights of Texas and Louisiana children between 6 and 71 months of age were compared with heights of a similar age group of Iowa children. The average height of the children in the sample was less than that of the Iowa children of a similar age. For example, in Texas 41 percent of the males and 40 percent of the females were shorter by more than one standard deviation below the Iowa mean. If growth of these children had been comparable to the Iowa children, one would have expected this percentage to be 16. There appears to be an ethnic and racial variation in growth with the Spanish-speaking and Negro accounting for the largest percent of those persons deviating from the mean. The trend of growth retardation as reflected in the height data was also observed in the bone growth as determined from the hand-wrist x-ray. (O–924–33, p. 16–17).

94. The results of the National Nutrition Survey which are reported in the above findings demonstrate the presence of malnutrition in a large portion of the sample population. A high prevalence of signs associated with inadequate nutrition, including growth retardation, was found. Anemia and unacceptable levels of plasma vitamin A, serum vitamin C, urinary thiamine excretion and urinary riboflavin excretion were common. These findings demonstrate the existence of a serious nutrition problem in Louisiana and Texas. Analysis of data from other states is not sufficiently advanced to permit a statement as to whether the same degree of prevalence of malnutrition exists in those areas. (O–924–33, p. 1–2; WD–46–Unglaub, p. 7–21).

95. The combined effect of the survey results reported in Findings 28 through 94 is to demonstrate that there are substantial segments of the U.S. population who consume diets which do not provide them with adequate amounts of vitamins and minerals. Twenty-seven qualified physicians and nutritionists testifying in this hearing agree that this is an accurate portrayal of the nutritional status of the U.S. population.

(Tr. 2955, Hodges; WD–46–Olson, p. 12–13; Tr. 29470–73, Olson; WD–46–Wallerstein, p. 9; WD–46–Margen, p. 8, p. 16; WD–46–Unglaub, p. 35; WD–46–Davis, p. 14; WD–46–Gershoff, p. 9; WD–46–Jukes, p. 8–9; WD–46–Severinghaus, p. 11–13, p. 19; WD–46–Schwartz, p. 5–6; WD–46–Mayer, p. 6–7; WD–46–Briggs, p. 23; WD–49–Kimpel, p. 4; WD–33–Coursin, p. 3; Tr. 27485–6, Coursin; WD–11–Graham, p. 14, p. 20; Tr. 26519, Tr. 26528, Graham; WD–11–Stokstad, p. 11; WD–33–Brin, p. 19–20; Tr. 27369–70, Brin; WD–33–Krehl, p. 18, p. 47–48; Tr. 26093–94, Tr. 26115, Sebrell; WD–65–Goodhart, p. 19; WD–65–Stare, p. 6; Tr. 29291–93, Stare; WD–65–Vitale, p. 8; Tr. 31864, Tr. 31907, Vitale; Tr. 11712–13, Schweigert; Tr. 1131, Tr. 25194, Filer; WD–65–Chow, p. 8; WD–49–Anderson, p. 13–14; WD–13–Scrimshaw, p. 3.)

These include:

(*a*) *George M. Briggs, Ph. D.*, Professor of Nutrition and Chairman of the Department of Nutritional Sciences, School of Public Health, University of California at Berkeley; and Editor of the Journal of Nutrition Education (O–588–46);

(*b*) *David B. Coursin, M.D.*, Director of Research at the Research Institute, St. Joseph's Hospital, Lancaster, Pa., Director of Research at the Lancaster Cleft Palate Clinic, and Member of the Editorial Boards of the *International Journal for Vitamin Research, Clinical Pediatrics, Child Development*, and the *Cleft Palate Journal* (O–526–33);

(*c*) *Lloyd J. Filer, Jr., M.D., Ph. D.*, Professor of Pediatrics and Professor of Pediatric Nutrition, University of Iowa College of Medicine, Member of the NAS-NRC Food and Nutrition Board and Chairman, of the Committee on Nutrition of the American Academy of Pediatrics (1969) (O–385–1);

(*d*) *Willard A. Krehl, Ph. D., M.D.*, Professor and Chairman of the Department of Preventive Medicine at Jefferson Medical College, Thomas Jefferson University (WD–33–Krehl, p. 1);

(*e*) *Jean Mayer, Ph. D., D.Sc.*, Professor of Nutrition at the School of Public Health, Harvard University, Chairman of the White House Conference on Food, Nutrition and Health, December, 1969, and Special Consultant to the President on Nutrition (O–585–46);

(*f*) *Robert E. Olson, Ph. D., M.D.*, Doisy Professor and Chairman of the Department of Biochemistry, and Associate Professor of Medicine, St. Louis University School of Medicine (O–586–46);

(*g*) *William H. Sebrell, Jr., M.D.*, Director of Columbia University's Institute of Nutritional Sciences, and Chairman of the Committee on Recommended Dietary Allowances of the NAS–NRC Food and Nutrition Board (1965–1968) (O–390–3A);

(*h*) *Frederick J. Stare, Ph. D., M.D.*, Chairman of the Department of Nutrition of the School of Public Health at Harvard University and author of the nationally syndicated column entitled, "Food and Your Health" (O–630–65);

(*i*) *Walter G. Unglaub, M.D.*, Professor of Nutrition and Director of the Nutrition Section, School of Public Health and Tropical Medicine, and Professor of Nutrition, School of Medicine of Tulane University, and Louisiana Director of the National Nutrition Survey (O–582–46); and

(*j*) *Ralph O. Wallerstein, M.D.*, Clinical Professor of Medicine at the University of California, Chief of Clinical Hematology at the San Francisco General Hospital, and Chief of Staff at Children's Hospital in San Francisco (O–610–46).

96. Most of the survey evidence which forms the basis for the opinions expressed by the physicans and nutritionists cited in Finding 95 is of recent origin, much of it having been developed or organized and widely disseminated during the period since 1966. (H.E.–13; O–924–33; P–568; P–762; O–464–28; H.E.–12; O–468–33; O–612–46; O–587–46; Tr. 31885, Vitale).

97. Some of the documentary exhibits or record offered explanations accounting for the dietary inadequacies which were observed. (O–612–46; O–36–19; O–587–46; O–599–46) In addition, numerous qualified nutritionists and physicians who appeared in this proceeding offered opinions concerning why people consume diets which furnish inadequate amounts of vitamins and minerals. (Finding 98–109, infra) The causes and vulnerable groups disclosed by this record evidence are set forth in the following findings.

98. It is the consensus of qualified physicians and nutritionists that many people of low socioeconomic status frequently do not consume diets which provide adequate amounts of vitamins and minerals simply because they lack the financial resources needed to purchase sufficient quantities of vitamin and mineral rich foods. (WD–46–Olson, p. 14; WD–46–Mayer, p. 9; Tr. 28853–4, Mayer; WD–33–Coursin, p. 6; Tr. 26504, Graham; WD–65–Goodhart, p. 10; WD–65–Vitale, p. 5).

99. It is the consensus of qualified nutritionists and physicians that there are many people who for ethnic, cultural or faddist reasons do not consume certain broad classes of food, with the result that they do not ingest adequate amounts of vitamins and minerals. (WD–46–Olson, p. 14; Tr. 29460–62, Olson; WD–46–Margen, p. 10, p. 16; WD–65–Goodhart, p. 10; WD–46–Unglaub, p. 31–32; WD–46–Mayer, p. 10–12; Tr. 28854, Tr. 28880–81, Mayer).

100. It is the consensus of qualified physicians and nutritionists that infants and young children because of the limited variety of foods contained in their diets and their rapid rate of growth frequently do not consume adequate amounts of vitamins and minerals. (WD–46–Wallerstein, p. 9, p. 12; Tr. 28976, Wallerstein; Tr. 29016, Margen; WD–46–Unglaub, p. 30; WD–46–Cooke, p. 1; WD–46–Schwartz, p. 6; WD–65–Stare, p. 4; Tr. 29290–91, Stare; WD–G–Harrison, p. 15; WD–49–Anderson, p. 14).

101. It is the consensus of qualified physicians and nutritionists that many teenagers deliberately shun good eating habits and limit the variety of foods which they consume, with the result that they do not ingest the amounts of vitamins and minerals regarded as adequate during this period of life. (WD–46–Margen, p. 10; WD–46–Unglaub, p. 6, p. 23; Tr. 28926–27, Unglaub; WD–46–Briggs, p. 27; WD–33–Krehl, p. 52–53; WD–65–Stare, p. 4; Tr. 29290–91, Stare; WD–65–Vitale, p. 5).

102. It is the consensus of qualified nutritionists and physicians that many teenagers and adults who are on weight reducing or weight maintenance diets restrict caloric intake to the point where the vitamins and minerals contained in the food that is consumed are not sufficient to meet the needs of these persons. (WD–46–Olson, p. 14; Tr. 29483, Olson; WD–46–Margen, p. 10; Tr. 29018, Margen; WD–46–White, p. 11–14; WD–46–Mayer, p. 14, p. 18–19: Tr. 28854, Tr. 28883–4, Mayer: WD–46–Briggs, p. 27; Tr. 26503–04, Graham; Tr. 26704, Stokstad: Tr. 29187, Stare).

103. It is the consensus of qualified nutritionists and physicians that many women of childbearing age, including those who are not pregnant, do not, and cannot as a practical matter, because of their high requirement, secure adequate amounts of iron from the diets they consume. (Tr. 6738, Hodges. WD–46–Olson, p. 11; WD–46–Wallerstein. p. 9, 11–12: Tr. 28976, Wallerstein: WD–46–Margen, p. 10; WD–46–White, p. 12–14; WD–46–Briggs, p. 27; Tr. 30179, Goodhart; Tr.

27218–19, Krehl; WD–33–Krehl, p. 14–15; WD–46–Unglaub, p. 30; WD–46–Schwartz, p. 6–10; WD–46–Mayer, p. 14–17; WD–65–Vitale, p. 5; Tr. 31914, Vitale; P–651, p. 58–59).

104. In addition, uncontradicted expert testimony indicates that women taking oral contraceptives often do not obtain the folacin they need, because the chemicals they ingest render the body less capable of absorbing folacin in the forms in which it appears in food. (WD–65–Vitale, p. 5; Tr. 31885–86, Vitale).

105. It is the consensus of qualified physicians and nutritionists that pregnant and lactating women, because of their increased need for vitamins and minerals and their low caloric allowances, often do not consume all of the vitamins and minerals they require. (Tr. 29016, Margen; Tr. 28926–7, Unglaub; Tr. 26705, Stokstad; WD–33–Krehl, p. 13–14; Tr. 30179, Goodhart, WD–65–Stare, p. 4, Tr. 29290–91, Stare; WD–64–Vitale, p. 5).

106. Uncontradicted record evidence indicates that blood donors lose 250 milligrams of iron per 500 ml. of blood given. If this amount is to be replaced in one year the body must absorb approximately .7 milligrams per day. Approximately 10 percent of dietary iron is absorbed. (Tr. 6739, Hodges) Thus the blood donor's requirement is increased by approximately 7 milligrams per day, an additional amount which his diet frequently will not provide. If more than one pint of blood is given per year, inadequate intake is even more likely to occur. (0–612–46, p. 120–21; WD–46–Wallerstein, p. 7).

107. Uncontradicted expert testimony indicates that those who consume moderate amounts of alcohol (more than three drinks per day) have increased requirements for folates, thiamine and magnesium which are not always met by the diets they consume. (WD–65–Vitale, p. 5; Tr. 31889–90, Vitale; WD–65–Iber p. 5–6).

108. It is the consensus of qualified nutritionists and physicians that many older people, especially those living alone, lack the physical ability or the desire to prepare and consume meals containing the variety of foods needed to furnish them with adequate amounts of vitamins and minerals. (WD–46–Olson, p. 14; Tr. 29484–85, Olson; WD–46–Unglaub, p. 6; Tr. 28926–27 Unglaub; WD–46–Mayer, p. 9; WD–46–Briggs, p. 27; Tr. 26600–02, Graham; Tr. 26704–05, Stokstad; WD–65–Stare, p. 4; WD–65–Vitale, p. 5; WD–49–Anderson, p. 14).

109. It is the consensus of qualified nutritionists and physicians that, in addition to the groups noted in the above findings, many people of all types fail to consume diets which provide adequate amounts of vitamins and minerals either because they lack knowledge of proper food selection, storage and preparation practices, or because they act in careless disregard of this knowledge. (Tr. 2955, Tr. 3055, Hodges; WD–46–Olson, p. 11; WD–46–Unglaub, p. 29–30; WD–46–Severinghaus, p. 13; WD–46–Mayer, p. 10–12, p. 14; Tr. 28854, Mayer; WD–46–Briggs, p. 27–28; WD–65–Goodhart, p. 10; Tr. 29187, Stare; WD–65–Vitale, p. 5; Tr. 31889, Vitale).

110. The above findings of fact taken together demonstrate that there are large numbers of people among the population of the United States who are not obtaining sufficient amounts of vitamins and minerals from the diets they consume. The groups within which these individuals are most likely to be found include the poor, those who avoid certain classes of foods, infants and young children, teenagers, weight watchers, women of childbearing age including but not limited to those who take oral contraceptives, those who are pregnant and those who are lactating, blood donors, moderate drinkers, older people who live alone, and those people who are ignorant or careless of good eating habits.

APPENDIX B

ANALYSIS OF THE NEED FOR DIETARY SUPPLEMENTS AMONG CHILDREN BASED ON THE LATEST REPORT ON THE NATIONAL NUTRITION SURVEY

As you know, a comprehensive investigation of nutritional status was performed in 10 states by the National Nutrition Survey. The most recent publication of the results of this study is entitled "Ten-State Nutrition Survey in the United States, 1968–1970," which the Department of Health, Education and Welfare describes as a "preliminary" report to Congress.

This report presents tabulated results of biochemical analyses for four micronutrients: iron, vitamin A, vitamin C and riboflavin. The following table shows the frequency (expressed as percentages of all children tested) of unacceptable values among children:

	Hemoglobin (iron)	Vitamin A	Vitamin C	Riboflavin
Age:				
0 to 5	20. 0	15. 5	6. 5	19. 9
6 to 9	15. 5	15. 3	4. 8	14. 2
10 to 16	14. 3	9. 6	4. 7	17. 1

Source: Tables 8D, 9D, 10D, 11D.

Multivitamin and mineral supplements would benefit anyone whose diet fails to provide sufficient amounts of at least one of the micronutrients they contain. Consequently, the percentage of children in the National Nutrition Survey who would benefit from use of a supplement containing iron, vitamin A, vitamin C and riboflavin is that percentage whose diet habitually provides inadequate amounts of at least one of these.

Subject to stated assumptions, the range within which this percentage must fall can be determined using the figures in the above table. The first, and key, assumption which must be made, is that the reported low and deficient biochemical levels arise from insufficient amounts of micronutrients in the diet.

The bounds of the range are based on the assumption of dependence among the four variables, i.e., the four types of inadequacy. If two variables are dependent, it means that their occurrence is in some way related, which relationship can take several forms. For example, if event "x" occurs, it may be the case that dependent event "y" can never occur or will always occur. A third possibility is that "y" may or may not occur when "x" occurs, but "y" never occurs unless "x" does occur.

The third possibility is usable in establishing the lower bound of the range in terms of the statement, "Individuals who are biochemically inadequate in one micronutrient are frequently inadequate in several." There is some survey support for this statement. In the face of the present data, for children 0–5 where hemoglobin inadequacy is the most frequent, the lower bound of the range may be stated, "Vitamin A, C or riboflavin inadequacy may or may not occur when hemoglobin inadequacy occurs, but they will not occur unless hemoglobin inadequacy does occur." This means that the percentage of these children who would benefit from a supplement of iron, vitamin A, vitamin C, and riboflavin would equal the percentage low in hemoglobin, namely, 20.0%. In the case of 6–9 year olds the lower bound would also be determined by hemoglobin and would equal 15.5%. For 10–16 year olds it would be determined by riboflavin and would equal 17.1%.

The upper bound of the range, the maximum percentage of children who would benefit from a supplement containing iron, vitamin A, vitamin C, and riboflavin, is representable in terms of the following statement, "No person is inadequate in more than one micronutrient." The total who would be inadequate in one micronutrient would thus equal the sum of the four percentages of inadequacy:

Upper bound equals:
(percent inadequate in hemoglobin) +
(percent inadequate in vitamin A) +
(percent inadequate in vitamin C) +
(percent inadequate in riboflavin).

In the case of 0–5 year olds this would total 61.9%. The total for 6–9 year olds would be 49.8%, and for 10–16 year olds it would be 45.7%.

The following table summarizes the lower and upper bounds computed above:

	Lower bound (percent)	Upper bound (percent)
Age group:		
0 to 5	20. 0	61. 9
6 to 9	15. 5	49. 8
10 to 16	17. 1	45. 7

The most likely percentage of children who would benefit from the supplement discussed above is probably neither the lower nor upper bound of the range. The reason is that experience with nutrition surveys shows that the conditions assumed to establish these bounds are not frequently observed in practice.

One method for estimating the most likely percentage of beneficiaries follows from assuming a condition of stochastic independence, i.e., the occurrence of vitamin A, C, or riboflavin inadequacy is completely unrelated to the occurrence of hemoglobin inadequacy. Under this assumption the probability of a child having a low level of at least one of the four micronutrients (P) is determined by the following formula:

P equals: 1—(probability of iron adequacy) (probability of vitamin A adequacy) (probability of vitamin C adequacy) (probability of riboflavin adequacy)

From the above table the following probabilities are derived:

	0 to 5 years	6 to 9 years	10 to 16 years
Probability of iron adequacy	1−. 200=. 800	1−. 155=. 845	1−. 143=. 857
Probability of vitamin A adequacy	1−. 155=. 845	1−. 153=. 847	1−. 096=. 904
Probability of vitamin C adequacy	1−. 065=. 935	1−. 048=. 952	1−. 047=. 953
Probability of riboflavin adequacy	1−. 199=. 801	1−. 142=. 858	1−. 171=. 829

Inserting these values in the formula one finds that the most likely percentages for the three age groups are as follows:

P (0 to 5 years) equals:
1—(.800) (.845) (.935) (.801).
1—.506.
.494 or 49.4%.

P (6 to 9 years) equals:
1—(.845) (.847) (.952) (.858).
1—.585.
.415 or 41.5 %.

P (10 to 16 years) equals:
1—(.857) (.904) (.953) (.829).
1—.613.
.387 or 38.7%.

Thus we estimate the percentage of children surveyed who would benefit from use of a supplement containing these four micronutrients as being 49.4% in the case of 0–5 year olds, 41.5% in the case of 6–9 year olds, and 38.7% in the case of 10–16 year olds.

These figures are offered subject to the caveat that, while presented in terms of three significant digits, they probably do not merit this degree of precision. Both the basic data and the assumption of independence could introduce errors making this level of precision inappropriate.

The latest report of the National Nutrition Survey also contains some results of height and weight measurements. Insufficient information is presented to allow analysis of these and the report itself contains none. Very preliminary and incomplete dietary intake results for five states are also included. These are totally beyond analysis since the standards used by HEW in judging adequacy are not contained in the report. Thus the anthropomorphic and dietary data cannot be used meaningfully to corroborate or impeach the estimates computed above.

MILES LABORATORIES, INC.,
Washington, D.C., February 16, 1972.

MR. GERALD CASSIDY,
Counsel, Senate Select Committee on Nutrition and Human Needs, U.S. Senate,
Washington, D.C.

DEAR MR. CASSIDY: I am pleased to provide for the Committee's use the legal opinion of Kirkland Ellis & Rowe that dietary supplements may be added to the National School Lunch Program under existing law and regulations. This submission is made pursuant to the request of Senator Taft during the testimony of Dr. White on December 7, 1971.

Please advise if we can be of any further assistance.

Very truly yours,

CHARLES N. JOLLY,
Legislative Representative.

[ENCLOSURE]

KIRKLAND, ELLIS & ROWE,
Washington, D.C., February 15, 1972.

Re Dietary Supplements in the National School Lunch Program.

CHARLES N. JOLLY, ESQ.,
Miles Laboratories, Inc.,
Washington, D.C.

DEAR MR. JOLLY: Enclosed pursuant to your request is a copy of our memorandum summarizing how federal statutory provisions and Department of Agriculture regulations would enable the inclusion of dietary food supplements of vitamins and minerals in the National School Lunch Program.

As you will recall the analysis contained in the memorandum was prepared in anticipation of the appearance of Miles' president, Walter A. Compton, M.D. before the Senate Select Committee on Nutrition and Human Needs on February 24, 1971. However, I am aware of no changes in statutory authority or in Department of Agriculture regulations which would alter the conclusions set forth in the memorandum.

Thus, it is our opinion that the statutory framework provided by Congress and the regulations promulgated by the Department of Agriculture would permit the inclusion of dietary supplements of vitamins and minerals in the National School Lunch Program.

Sincerely yours,

JAMES M. JOHNSTON.

[ENCLOSURE]

MEMORANDUM

EXPANDING THE NATIONAL SCHOOL LUNCH PROGRAM TO INCLUDE DIETARY SUPPLEMENTS, AN ANALYSIS OF EXISTING AUTHORITY

SUMMARY

Questions presented

Can dietary supplements of vitamins and minerals be incorporated in the National School Lunch Program within the framework established by existing federal statutes and Department of Agriculture regulations?

Conclusion

Dietary Supplements can be added to the National School Lunch Program under existing law.

DISCUSSION

Dietary supplements

In performing our analysis it has been assumed that the dietary supplements of vitamins and minerals desired to be incorporated in the school lunch program are formulated with reference to the Recommended Dietary Allowances established by the National Academy of Sciences' Food and Nutrition Board, as set forth in *Recommended Dietary Allowances*, NAS Pub. 1694 (1968). It is further assumed that such dietary supplements, offered for the purpose of assuring that the diet contains recommended amounts of the vitamins and minerals they contain, would meet the requirements of U.S. Food and Drug Administration regulations governing "foods for special dietary uses." 21 C.F.R. Part 125.

The National School Lunch Program

The statutory authority governing the National School Lunch Program and related child nutrition activities is found in 42 U.S.C. §§ 1751–1779. The school lunch program was initiated by the National School Lunch Act which was enacted in 1946. Subsequently, the statutory authority has been amended and supplemented several times as Congress has refined and further expanded the scope of the school lunch program and associated child feeding activities.

There are two basic methods under these statutory provisions by which schools may be provided with food for their lunch programs. Under the first of these procedures, the federal government purchases foods and then donates them to schools. The second procedure involves school systems purchasing food for their programs and then being reimbursed by the federal government under a matching grant formula.

Federal purchase of food

The statutory authority for the direct purchase of food by the Secretary of Agriculture is contained in 42 U.S.C. § 1755, which took its present form pursuant to a 1970 amendment. Pub. L. 91–248, § 3, 84 Stat. 209. This is commonly referred to as "Section 6" authority since it originated as Section 6 of the 1946 National School Lunch Act. The language of this section which applies to the present discussion reads as follows:

> The funds provided by appropriation or transfer from other accounts for any fiscal year . . . shall be available to the Secretary during such year for direct expenditure by him for agricultural commodities and other foods to be distributed among the States and schools and service institutions participating in the food service programs under this chapter and under the Child Nutrition Act of 1966 in accordance with the needs as determined by the local school and service institution authorities . . . .

It is our understanding that up to the present time procurement under this section has been limited primarily to fresh fruits and vegetables, processed flours, canned fruits or vegetables and frozen meats and poultry. However, it is plain from the language of the statute that the Secretary is free to purchase "other foods" when to do so would be "in accordance with the needs as determined by the local school and service institution authorities."

Thus, the Secretary of Agriculture's direct procurement authority leaves complete freedom to respond to the needs of the program, and in fact we understand that the Department is presently engaging in a series of investigations through Rutgers University to determine various types of "other foods" which might enhance the program's ability to provide improved nutrition within the limits of its resources. Since the proposed supplement would by definition be a food, it also could be purchased under the Secretary's authority to procure "other foods."

Specific regulations governing the procedures to be used in the purchase of foods by the Department of Agriculture are contained in 7 C.F.R. Part 250. None of these limits the scope of the purchasing power contained in the statutory language quoted above.

Cash payments to States

The other basic means of supporting the school lunch program provided by federal law is through cash payments authorized by 42 U.S.C. § 1756, which is an amended version of Section 7 of the National School Lunch Act. See Pub. L. 91–248, § 4, 84 Stat. 209 (1970). Pursuant to the authority of this section, the Secretary has the following power:

> Funds apportioned to any State . . . shall be available for payment to such State for disbursement by the State educational agency . . . for the purpose of assisting schools of that State during such fiscal year, in supplying (1) agricultural commodities and other foods for consumption by children. . . .

Here again, this section affords the Secretary great latitude in the use of cash payments by allowing him, subject to matching fund requirements, to assist schools in supplying "agricultural commodities *and other foods* for consumption by children." As in the case of foods purchased for donation, the Secretary's authority to provide cash payments for "other foods" would allow him to reimburse states using the proposed supplements in their school lunches.

Requirements placed on school lunches

There is a further statutory requirement for school lunch programs supported pursuant to the National School Lunch Act. This is contained in 42 U.S.C. § 1758. In pertinent part it reads as follows:

> Lunches served by schools participating in the school-lunch program under this chapter shall meet minimum nutritional requirements prescribed by the Secretary on the basis of tested nutritional research; except that such minimum nutritional requirements shall not be construed to prohibit the substitution of foods to accommodate the medical or other special dietary needs of individual students.

This provision provides that lunches served in the school lunch program must meet "minimum nutritional requirements," but it in no way limits the

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program from attempting to meet more than minimum requirements. Therefore the requirement that lunches meet minimum standards does not bar expanding the program through the addition of dietary supplements to provide improved vitamin and mineral nutrition.

The Department of Agriculture's regulations governing the National School Lunch Program are contained in 7 C.F.R. Part 210. These regulations further specify the requirements placed on lunches funded under the program.

Some schools receive donated commodities from the federal government but no cash payments. These are termed "commodity-only schools" and are technically not participants in the National School Lunch Program. 7 C F.R. § 210.2 (c–1). The "commodities" they receive may be any "foods donated, or available for donation, by the Department" including those purchased under the "Section 6" authority discussed above. 7 C.F.R. § 250.3(a).

Commodity-only schools must meet the standards for lunches prescribed by Section 210.15a(b) of the regulations:

> (b) The school-fund authority of a commodity-only school desiring to receive commodities donated under Part 250 of this chapter shall enter into agreement with the State Agency, or FNSRO where applicable. The agreements with commodity-only schools shall . . . require such schools to serve well-balanced nutritious lunches, priced as a unit, that contain, as a minimum, food components from the four basic food groups as defined in the Department's Daily Food Guide (Leaflet No. 424 USDA).

Thus, the administrators could donate supplements to commodity-only schools so long as these schools serve lunches containing "components from the four basic food groups" and which otherwise meet the above broad standards.

Section 210.8 of the regulations requires that for schools to qualify to receive cash reimbursement from the federal government, they must serve lunches which comply with 7 C.F.R. § 210.10. Section 210.10 outlines the specific requirements for lunches in some detail. It is this section of the Department of Agriculture's regulations which defines the "Type A lunch" and the "Type C lunch" which are the two basic lunch units used by the National School Lunch Program.

In addition to specifying the contents of the Type A and Type C lunches, Section 210.10 makes provision for varying the Type A lunch when such action will serve to achieve the objectives of the program. Specifically, subsection 210.10(g) reads as follows:

> The CND [Child Nutrition Division, Food and Nutrition Service of the Department] may approve variations in the food components of the Type A lunch on an experimental or on a continuing basis in any school where there is evidence that such variations are nutritionally sound and are necessary to meet ethnic, religious, economic or physical needs.

This subsection appears expressly to enable the administrators of the program to vary the Type A school lunch through the inclusion of dietary supplements of vitamins and minerals. That is, based on the information which we have been furnished, it would be completely appropriate to include dietary supplements in the program since they "are nutritionally sound and are necessary to meet . . . economic or physical needs."

Thus, the statutory authority and existing regulations discussed herein would not appear to bar the school lunch program administrators from incorporating dietary supplements in the program should they so desire.

Appendix 2

MATERIAL FROM OTHER THAN WITNESSES

RUTGERS UNIVERSITY,
New Brunswick, N.J., December 17, 1971.

Hon. GEORGE MCGOVERN,
Chairman, Select Committee on Nutrition and Human Needs, Senate Office Building, Washington, D.C.

DEAR SENATOR MCGOVERN: A press release in the Newark Star Ledger of December 8th, provides short excerpts of the testimony of Drs. Graham, Briggs, White and others suggesting that vitamin pills or wafers be a part of the school feeding programs etc.

As the Director of the USDA/OEO School Feeding Effectiveness Research Project at Rutgers let me say that I agree that the diets of Americans and school children is imbalanced with too few or poor levels of micronutrients (vitamins and minerals) and too many calories; however, the provisioning of pills is not the answer because:

(1) The consumption of pills does not need to be fostered in our pill taking culture.

(2) The probability of toxic effects is greater (the second largest cause of poisoning in U.S. children is excess vitamins).

(3) It is estimated that nearly 100 million Americans now take daily vitamin supplements and the quality of nutritional health has not reflected this.

(4) Most water soluble vitamins are excreted within 4–6 hours and so one shot pills are an inefficient means of providing necessary micronutrients.

(5) The metabolism of micronutrients is most intimately associated with the metabolism of protein and/or the synthesis of protein tissues such as hemoglobin. It stands to reason therefore, that micronutrients should be titrated to protein levels in food products not to calories only or foods with no protein content.

(6) The use of vitamin pills or wafers only in school or institutional feeding has an impact on the dietary of a limited number of Americans in an irregular manner (e.g. we feed children in school 180 days a year and the other 185 days they are on their own).

(7) The nutrified engineered foods now available or under development in increasing numbers for the Rutgers School Feeding Effectiveness Project have the potential of *responsible* nutrition as well as responsive nutrition because the products are balanced for RDA nutrients in themselves or as combined with nutrient rich commodity foods. Further all the companies involved have agreed to make their products available commercially and they are critically reexamining their product lines.

I trust the committee will view the problem in perspective before supporting a partial answer rather than a full answer to the problem.

Since your office rarely acknowledges letters, I am taking the liberty of providing copies of this letter to other members of the committee and other selected Senators.

Sincerely yours,

PAUL A. LACHANCE, Ph. D..
Associate Professor of Nutritional Physiology.

Appendix 3

ARTICLES OF INTEREST

Previous to the Hearing

[The Des Moines Tribune, Nov. 17, 1971]

SCHOOL GOAL: NO "CANDY LUNCH"

(By William O'Keefe)

Most Iowa school districts—with an eye on their bank accounts—are complying with a U.S. Department of Agriculture (USDA) regulation that soft drinks, candy and other confections not be sold during regular school lunch and breakfast periods.

Des Moines and Saydel school officials told The Tribune the proscribed items are still being sold, but that they hope to be in compliance with the federal directive by the end of this week.

The State Department of Public Instruction, which is enforcing the rule, has warned school administrators that violation of the lunch rule could cost the districts their annual federal reimbursement of six cents a regular meal and 40 cents for each free or reduced-price meal served.

In Des Moines, that amounts to more than $300,000 a year.

According to the federal requirement, candy, soft drinks, potato chips and popcorn may not be sold in the schools from a half hour before to a half hour after the breakfast and lunch periods.

The ban on sales from vending machines and snack bars is designed to force students to eat the balanced school lunch instead of eating snacks, which may not provide proper nutrition.

"Too Much to Lose"

Mrs. Janice Dudley, Des Moines public schools director of food services, said principals and administrators have been meeting to resolve the situation because "we don't want to lose our federal reimbursement. It's much too much to lose."

Mrs. Dudley said the food services department does not sell soft drinks, candy, potato chips or popcorn during the lunch and breakfast periods but that student centers and snack bars in some of the schools do.

Saydel Supt. Richard Branstrator said he learned just this week that candy and soft-drink machines still were open at his district's schools during the lunch hour. He said he planned to close them down by the end of the week.

Other school officials in Polk County and central Iowa contacted by The Tribune said they have stopped the sale of the items during lunch and breakfast periods. Several also reported the action was unpopular with students.

Profits from the candy and soft-drink sales in many schools are channeled into student activity treasuries.

Loss Feared

The newly enforced rules have prompted some student bodies to complain about possible loss in revenue as well as the students not being able to buy the confections of their choice.

Urbandale Supt. Lyle Kehm pointed out that snack machines are "very popular among our students" and it is only natural that they would be unhappy if they could not buy the snacks during lunch.

"But we really have no choice in the matter. We have to comply with it (federal regulation)," he added.

Donald Butcher, Southeast Polk School District food services director, agreed, saying: "We do get flak (from students) because there are some who bring their own lunch and others—especially girls on diets—who just want to buy (diet) pop instead of a regular lunch," he said.

DISPLEASED

West Des Moines Supt. Charles Joss said students are displeased because they contend that some other school districts are violating the rule.

But students at some schools apparently are taking the curtailed candy and beverage sales in stride.

Johnston Supt. Louis Friestad and Marshalltown Supt. Robert McFarland said the students have not raised any hue and cry about the absence of candy or soft drinks at lunch.

"We have discussed this with the student council and nobody is shaken up about it," said Friestad.

McFarland said there has been no problem in his school because of a wide variety of food offered for sale, including a la carte lunches.

The rationale underlying the federal regulation was explained by Vern Carpenter, food services chief for the State Department of Public Instruction.

"The idea is to improve the nutrition and health of the students. Carbonated beverages, candy, chips and popcorn are not a component part of a Grade A lunch," he said.

WELL-BALANCED MEAL

Carpenter said a Grade A lunch contains the basic nutritional ingredients of protein, vegetables and fruits, bread, butter and milk.

"We want to avoid the situation of a kid coming to the lunch room and buying the other things and not eating the well-balanced meal after his parents have already paid for it," he said.

Carpenter said response to the federal regulation throughout Iowa "has been all on the positive side." He added:

"We're not using this as a club and hope that all schools will voluntarily comply.

"I feel encouraged that all school districts in the state will comply."

Subsequent to the Hearing

[The Baltimore Sun, Dec. 8, 1971]

NUTRITION WAFERS GET SENATE TEST

(By Naomi S. Rovner)

Washington—Candy-like wafers designed to transform a hot dog and a bag of potato chips into a nutritionally balanced meal got a senatorial taste test here yesterday at a hearing into ways to assure the nutritional value of school lunch programs.

And to underscore the necessity for this kind of food supplement, a Johns Hopkins University nutrition professor showed a dozen slides taken at the Johns Hopkins Medical School staff cafeteria to members of a special Senate subcommittee on food and nutrition.

The slides first showed appetizing and nutritionally balanced meat-and-vegetable meals on the cafeteria shelves; then they showed interns and residents by the score eating hamburgers and potato chips and hot dogs and potato chips.

Dr. George C. Graham, the Hopkins nutritionist, noting that the young doctors were thoroughly aware of the nutritional value of spinach and broccoli and passed it up anyway, speculated that school youngsters were doing the same.

"Uneaten food," he noted, "has a nutritional value of zero."

NO EFFECT ON GROWTH

He questioned the nutritional usefulness of school lunches as they are now served, and cited a "small study" done by the Hopkins at several Baltimore schools where lunches were served.

The study, admittedly not a conclusive one, showed that the school lunch program appeared to have no effect on the growth or blood count of the participating youngsters.

The wafers, which come in several different colors, were developed by Miles Laboratories to be distributed with school lunches.

They contain, in candy form, the recommended daily dosages of 13 vitamins and minerals and were especially designed to be attractive enough in taste, shape and color to assure that they will be eaten.

(Reporters who tasted the chewable wafers yesterday found them pleasantly tart and fruity, but with a bitter aftertaste.)

Spokesmen for the laboratory and for the Vitamin Information Bureau—the trade association for vitamin manufactures—said they could be distributed with the lunches for about a cent a day for each child.

"GROWING TREND"

Dr. Graham confirmed that dietary habits, even among higher-income groups, are changing radically, and supplements appear to be needed particularly by "the poor, the adolescent, the pregnant and the elderly."

Underlying this, he said, is "a growing trend toward the consumption of convenience foods. . . . We are shocked when we find that items which we like or were forced to like because of their nutrient content are turned down [by young people] with a 'yukk.' "

He called this trend "a relentless one," and said that a yearning to "go back to the good old days of natural foods, bought fresh, prepared carefully and served with careful attention to the basic food groups . . . is an impossible dream."

He suggested that a food supplement such as the wafer might at least serve as a temporary protection until "more definitive solutions" are reached.

[From the Montgomery (Ala.) Advertiser, Dec. 8, 1971]

UNIVERSAL MALNUTRITION IN AMERICA

A panel of nutritionists told the Senate that the diets of many children are "marginally deficient or atrociously so."

And it's getting worse, according to one witness, Dr. George Graham, professor of nutrition and associate professor of pediatrics at Johns Hopkins University:

"There is little doubt now about the deterioration in the nutritional quality of the diets consumed by a steadily increasing percentage of children *from all classes.*"

More than half of what children (and adults as well) eat is severely inadequate in terms of vitamin and mineral content, the panel said. In a year, the average American consumes 264 pounds of "poor value foods" and only 259 pounds of "high value foods."

Poor value foods are high in calories but low in protein, vitamins and minerals. The reverse is true in the case of high value foods, ranging from meat to peanuts.

Well over half of children under 12 don't get enough iron; and that rises to two-thirds of those from 12 to 21.

The most undernourished member of the American family is, typically, the teen-age girl. The best nourished, surprisingly enough, is the teen-age boy, probably because he eats *everything*—good food along with junk.

Much of the food eaten in the country is not as nutritious as sawdust, although some of it, particularly the pre-processed foods, taste like that.

The panel recommended that vitamin wafers be added to school lunches to provide the Recommended Dietary Allowance (RDA) of various vitamins and minerals, including calcium, iron, etc., to make up for deficiencies of meals at school and at home.

What to do about adults, who don't eat much better but at least have their growth behind them, is still a puzzle.

But it's no small problem. One witness told the Senate that Americans spend $30 billion a year on nutrition-related problems.

That is one-half the total health care cost in the country.

[The Washington Post, Dec. 8, 1971]

VITAMINS AS CANDY WAFERS?

(By United Press International)

Can a child's view of vitamins be changed from "yuk" to "yum" if they come packaged as candy wafers instead of in such things as spinach, broccoli and brussels sprouts?

Miles Laboratories thinks so—and today urged Congress to provide such a dietary supplement for the 25 million youngsters who participate in government school lunch programs.

A panel of nutritionists, some of whom worked on developing a new Miles candy-type tablet containing 13 vital vitamins and minerals, told a Senate Hunger Committee such a supplement is badly needed to combat widespread malnutrition among school children.

"Numerous surveys have shown a significant percentage of these children are consuming diets which are considered anywhere from marginally deficient to atrociously so," said Dr. George G. Graham, a nutritionist and pediatrician at Johns Hopkins University.

Graham, one of those who worked on the Miles project, warned that "in the not too distant future" doctors would begin seeing children made seriously sick by their deficient diets and said supplements could provide them "temporary protection" until better long-term nutrition solutions are found.

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